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PUBLIC UTILITIES IN THE WEST BANK AND GAZA STRIP

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* This study constitutes part one of the contribution made by Dr. Sameer A. Abu-Eisheh (Al-Najah University, West Bank) to the intersectoral project of the UNCTAD secretariat on "Prospects for sustained development of the Palestinian economy in the West Bank and Gaza Strip". The opinions expressed in this study are those of the author and do not necessarily reflect those of the secretariat of the United Nations. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the secretariat of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

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List of abbreviations

CBS	Central Bureau of Statistics
Dunum	One hectare (1,000 square metres)
GDP	Gross domestic product
IEC	Israel Electric Corporation
IS	Israeli shekels
JD	Jordanian dinar
JDEC	Jerusalem District Electricity Company
m^2	Square metre
m^3	Cubic metre
mcm	Million cubic metres
NGO	Non-governmental organization
NIS	New Israeli shekels
OPT	Occupied Palestinian territory (the terms: "occupied territory" or "territory" refer to occupied Palestinian territory)
PVO	Private voluntary organizations
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNRWA	United Nations Relief and Works Agency for Palestinian Refugees in the Near East
$	United States dollar
..	Data not available
-	Equals zero or negligible

Preface

i. As part of the work programme pursuant to resolution 239 (XXIII) of the Trade and Development Board and resolution 44/174 of the General Assembly, the UNCTAD secretariat initiated, in 1990/91, the preparation of an in-depth intersectoral project on the economy of the West Bank and Gaza Strip. Part one of the project deals with a comprehensive assessment of the economic and social situation in the West Bank and Gaza Strip, the main impediments to sustained growth and development, pressing needs, and corresponding measures for immediate action to promote recovery. Part two of the project constitutes an in-depth analysis of prospects under different scenarios for the future development of the Palestinian economy. Part three of the project is intended to provide both a strategy framework and policy guidelines for the revival and sustained future development of the Palestinian economy in the West Bank and Gaza Strip.

ii. For the implementation of the project, a total of 25 in-depth studies were initiated at the field level covering economic and social sectors and issues. Concurrently, and in order to facilitate the technical aspects of work on parts two and three, the UNCTAD secretariat has also prepared an in-depth study of a quantitative framework examining future options and prospects under several scenarios. The summary findings of the field studies, in particular an identification of pressing needs and corresponding feasible measures for immediate action, were presented for further consideration by an expert group meeting (held in May 1992). The report of that meeting is published separately for further consideration (UNCTAD/DSD/SEU/2). The secretariat's study of a quantitative framework for analysing future prospects (UNCTAD/DSD/SEU/3) is in the process of finalization and will be published in due course.

iii. In order to provide more detailed substantive background to the findings and recommendations of the expert group meeting, and to enable donors further to develop their programmes of assistance to the Palestinian people, the first parts of a selected number of the field studies, commissioned within the scope of this project, are being published in a special study series on Palestinian economic and social development. The second and third parts of the field studies will be subsequently consolidated by the UNCTAD secretariat.

iv. The present study (prepared by an UNCTAD consultant, Mr. Sameer Abu-Eisheh, Al-Najah University, West Bank) constitutes a background document reviewing developments in public utilities in the occupied Palestinian territory (the West Bank and Gaza Strip) since 1948, with a focus on the period 1967 to 1990. The first chapter examines the structure and performance of public utilities up to 1967, covering water and electricity utilities, sewerage and solid waste collection, slaughterhouses and public markets, as well as public safety services. Chapter II examines the same set of public utilities in the post-1967 period, in different areas of the West Bank and Gaza Strip. Chapter III assesses the adequacy and efficiency of existing public utilities in the occupied Palestinian territory, including

supply and demand considerations, investment and capital formation, economic contribution, cost and pricing policies, and manpower and technology issues. Chapter IV presents a set of recommendations for immediate measures to improve the current conditions of Palestinian public utilities.

v. It should be noted that, in view of the early completion of these in-depth sectoral studies undertaken within the context of the intersectoral project, the implications of the accords concluded between Israel and Palestine in 1993 and 1994 could not be reflected in this study.

INTRODUCTION

Public utilities - covering such basic goods and services as water, electricity, sewerage and refuse collection and others - receive special treatment in economics owing to their particular nature. They share a common basic characteristic that is, their provision to one extra consumer entails relatively low marginal cost. Public utilities are moreover, characterized by large and indivisible fixed costs (lumpy investments) with relatively long-run payoffs. These considerations render the private sector reluctant to invest in public utilities. There is also the argument that private sector control may lead to a monopolistic situation where social considerations are disregarded. These are some of the reasons why the public sector in many countries, both developed and developing, engages in heavy investments and provides these utilities at affordable prices. Needless to say, under these circumstances the provision of such goods and services has invariably concealed an element of subsidy which distorts their real economic value. It is not surprising, therefore, that a continuing drain on government budgets and efficiency considerations have recently prompted many governments to privatize a growing number of utilities while putting in place the necessary regulations to safeguard social considerations.

Public utilities constitute one of the basic sectors of the Palestinian economy in the occupied territory. Owing to the situation resulting from the occupation of the West Bank and Gaza Strip since 1967, the municipalities and local authorities have emerged as the main public bodies responsible for providing and managing public utilities. This study is devoted to an examination of the development in the West Bank and Gaza Strip of such public utilities as water, electricity, sewerage, refuse, slaughterhouses, municipal markets and public safety.

Data utilized in the preparation of the study draws on both primary and secondary sources, including data supplied directly by public utilities and existing reports and studies. One of the prevailing constraints encountered in the preparation of a detailed study of this vital sector, as in many others, has been the lack of complete and reliable information. Every effort has been made to collect data through personal visits to public utilities as well as concerned municipalities, companies, institutions, departments and some local village authorities in the West Bank and Gaza Strip. Unfortunately, the vast majority of these do not have any documentation regarding public utility conditions and developments. Many facts and figures supplied suffer from obvious inaccuracy; some respondents were reluctant to give information. In many cases where municipal councils were appointed by the Israeli authorities, the administration and staff did not cooperate in providing the necessary information. Restrictions on travel by the Israeli authorities inhibited access to the required data. In summary, data shortages and limitations constituted major obstacles during the preparation of this study, especially for sub-sectors other than water and electricity. Therefore, the coverage of these utilities is neither even nor systematic for the various sub-sectors and sub-districts.

The presentation of each utility is based on the regional administrative divisions prior to 1967. According to Jordanian administrative policies, the West Bank was divided into three districts: Jerusalem, Nablus and Hebron. Jerusalem district was divided into Jerusalem, Ramallah, Bethlehem and Jericho

sub-districts. Nablus district was divided into Nablus, Jenin and Tulkarm sub-districts. Hebron district had one sub-district. Conversely, Gaza Strip, which was under Egyptian rule until 1967, is considered as one district. The existing administrative divisions set up by the Israeli authorities on the eve of occupation are unacceptable and, therefore, are not considered here. The area and population (urban and rural) of the sub-districts of the occupied Palestinian territory are presented in table 1.

Chapters I and II discuss the situation of public utilities before and after 1967, respectively. The structure and scope of the discussion encompass such aspects of the subject as performance, capital formation, cost and pricing, and management.

Chapter III presents an analysis and assessment of the adequacy and efficiency of public utilities in the West Bank and Gaza Strip. The dimensions considered in the analysis include: supply and demand considerations; investment and capital formation; contribution to the economy; costing, financing and pricing policies; and manpower and technology factors.

Finally, Chapter IV of the study presents conclusions and recommendations for suggested short-term action aimed at improving the conditions of the various public utilities in the West Bank and Gaza Strip.

Chapter I

THE STRUCTURE AND PERFORMANCE OF PUBLIC UTILITIES IN THE WEST BANK AND GAZA STRIP UP TO 1967

This chapter examines the development of public utilities in the West Bank and Gaza Strip prior to 1967. The scope and structure, performance and other aspects of public utilities in each sector are discussed according to regional administrative divisions of the West Bank and Gaza Strip prior to 1967.

A. Water

Water utilities in the West Bank and Gaza Strip before 1967 were limited to some municipalities, which in most cases were only partially served. Few villages had tapped water supply before 1967. Those which had were close to municipalities, particularly in the Jerusalem district. The total water consumption in the West Bank was estimated at 81.5 million cubic metres per year (mcm/yr) for 1964/65, of which the total quantity of water used for domestic purposes was 6.5 mcm. More than 97 per cent of domestic water consumption was for household use. 1/ There is no documented analysis comparing consumption with demand before 1967, but a number of projects initiated during the period to upgrade and develop water supply systems in urban areas imply that demand was probably not completely satisfied.

The control and administration of water supply and services for domestic use was the responsibility of the municipalities in the cities and towns, and of village officials in the communities. The municipalities were also responsible for supplying water for industrial use, especially where industry was based on small factories which existed within the boundaries of municipalities. In addition, the Jordanian Authority of Natural Resources had overall responsibility at the regional level. The authority was responsible for the preparation of feasibility studies, design, tendering documents, and the full supervision of project implementation.

Water supply in the Palestinian refugee camps was always the responsibility of UNRWA. If a camp was located within a municipality, water was supplied either partially or completely from the municipal sources. In most cases, in the West Bank or Gaza Strip, camps were supplied with drinking water from public standpipes located in camp main streets and connected to a water tank (either stationary and/or mobile).

1. The West Bank

The major source of water in the West Bank is groundwater. There are three water basins with an average annual renewable capacity of 580 mcm/yr. 2/ There is no appreciable surface water that can be used as a supply source for water utilities. However, a 1978 estimate puts the total capacity of water springs in the West Bank between 105 to 165 mcm/yr. 3/ The municipalities had drilled wells and/or collected water from springs and pumped it into reservoirs for distribution through installed pipe networks.

Until the beginning of the British mandate in 1918, Jerusalem and the surrounding villages were supplied with water from the ancient Solomon's

Pools, located close to Bethlehem. In 1898, the Turkish authorities restored the Pools in order to supply Jerusalem and Bethlehem. In 1937, two main pipelines were installed to bring in water from Ein Fara in the north-east and Ras Al-Ein in the west. After 1948, east Jerusalem continued to be supplied from Ein Fara and Solomon's Pools. The capacity of Solomon's Pools was increased to 0.65 mcm/yr, and was commissioned in the summer of 1962 by the Jordanian Central Water Authority. 4/ Ein Fara supplied from spring sources an annual average of 0.75 mcm/yr. Total annual demand for water was estimated to be about 1.2 mcm. A plan was developed by the Jerusalem District Water Department in 1964/65 to expand the water distribution system. The total population of the served areas, prior to 1967, was about 90,000. 5/

The cities of Ramallah, Al-Bireh and the surrounding villages used spring water and shallow wells and cisterns for water supply until 1948. After 1948, two companies were established to support water supply projects. As a result, in 1949, water was brought to the cities of Ramallah and Al-Bireh from Ein Fara near Jerusalem. In 1960, two reservoirs were built in Ramallah; one was a ground reservoir with storage capacity of 492 m^3; the second was elevated with storage capacity of 60 m^3. Water supply for both reservoirs comes from Ein Qinia.

This situation continued until 1963/64 when the Jordanian Government received a $3.5 million grant from the Agency for International Development (AID) to develop water supply projects for cities, including Ramallah and Al-Bireh. As a result, a new non-profit water company was established, in place of the two existing companies, with services extended in 1965 to a number of surrounding villages. The new company owned all water projects within the sub-district of Ramallah and became known as the Jerusalem District Water Authority Undertaking Area of Ramallah.

Bethlehem, Beit Jala and Beit Sahur were supplied with water until 1963 through the water authority of Jerusalem municipality. Water was pumped to these areas from the Al-Fawar well in Hebron and Solomon's Pools near Jerusalem. In 1963, the Water Authority of Bethlehem was established and the number of subscribers reached 400. In 1964, a borehole with a capacity of 100-120 m^3/hr was drilled at Beit Fajar with the help of Jordan's Authority of Natural Resources. The authority drilled another borehole at Batn-Algoul No.1 with a capacity of 75 to 80 m^3/hr. 6/ The number of subscribers in the Bethlehem area in 1967 was 1,800; the total volume of water consumed amounted to about 60 m^3/hr. There were no known water shortages at that time.

Most residents of Jericho had their own water supply source either directly from a well or from a cistern fed by truck water tankers. In 1967, the number of subscribers was 125, mostly commercial stores, offices and institutions located in the downtown area. The main water source was the spring at Ein El-Sultan with a capacity of 550 m^3/hr. 7/ The demand was clearly less than the supply. However, there is no documented information available about the exact level of demand.

The first water distribution system in Nablus was installed in 1934. The four springs of Ein Dafneh, Ras Al-Ein, Qaryoun, and Ein Al-Asal, with a total capacity of 120 m^3/hr, were used to supply drinking water to

the 17,000 inhabitants of the city. As the city grew, the water supply and distribution systems were expanded. The total supply of water during the year 1967 was around 1.7 mcm. 8/

The first well used for water supply in Jenin was drilled in 1927 during the British mandate. After 1948, a water company was established; a water distribution system of cast iron pipes was installed and a water reservoir with a capacity of 250 m^3 was built. As the city grew, the water supply problems began to appear. In 1960, hydrogeological studies were conducted and trial wells were dug. The maximum capacity of the municipality well in 1967 reached about 500 m^3/day. The municipality was charging 0.04 JD/m^3. 9/

A water distribution system was installed in Tulkarm at the beginning of the 1940s. Two wells were drilled and operated by the municipality to supply drinking water to the residents of the town. The total capacity of these wells reached 140 m^3/hr in 1967. 10/ The project served most of the town and some of the neighbouring locations.

The water distribution system in Hebron is old; some parts of it go back to the period of the British mandate. In 1940, the number of subscribers was less than one hundred while in 1967 it was about 2,200. No data are available regarding water demand. Before 1967, Hebron relied on two sources of water supply: water cisterns in homes (mainly rainwater); and the municipal water supply. One cubic metre of water was priced at 0.13 JD/m^3 in 1967. 11/

2. The Gaza Strip

Groundwater is the main water resource in the Gaza Strip. The average estimated annual capacity of the groundwater aquifer is about 80 mcm/yr. In 1967 the number of groundwater wells for all uses was about 1,000, the vast majority of which were agricultural wells. Only 14 wells supplied the urban areas in the Gaza Strip for domestic use, as described below. No data are available regarding water demand for Gaza Strip or for individual urban and rural areas.

Until 1967, the city of Gaza was supplied with water through 11 wells with a capacity of 8,000 to 9,000 m^3/day. 12/ The wells were mostly drilled manually. Two water reservoirs were in operation with a capacity of 2,500 m^3. Water was pumped to the reservoirs using diesel-motor driven pumps.

Deir El-Balah had a water distribution system supplying a small number of residents. The system supplied water for domestic purposes only. The system consisted of one well with a pump discharging to an old water reservoir having a capacity of 100 m^3 through 2-inch iron pipes. For agricultural purposes, water was supplied through private wells.

The installation of water distribution systems in Rafah began in 1963. Two wells for this purpose were drilled. The wells were 6 and 8 inches in diameter with capacities of 60 and 100 m^3/hr, respectively. The number of subscribers was around 1,000. Agricultural lands were irrigated from private wells.

B. Electricity

Uniform electricity services began in the region in 1928 in Jerusalem, where the British mandate granted concession to a private company in Jerusalem and its vicinity. Following that, other private companies began to operate in the major towns in order to supply the population with electricity. During the 1950s, most of the municipalities in the cities and major towns constructed their own electricity generation stations to serve their residents more uniformly and efficiently. A few of the large villages also began to generate their own electricity utilizing small generators.

1. The West Bank

By 1967, more than 80 per cent of the houses in urban areas had uniform electricity services. However, in rural areas and smaller towns, communities were not supplied by electricity from neighbouring cities or large town projects. Only the small towns and the larger villages had small generating units that were operated for illumination only. In 1967, around 23 per cent of the houses in rural areas had electricity services for just a few hours a day. The number of subscribers was very limited. In other situations, able individuals operated small self-owned units.

Electricity power generation began in Jerusalem in 1928 through a private company, which was given a concession under the British mandate to produce and distribute electricity in Jerusalem and the surrounding area. In March 1948, the British mandate authority signed an agreement with the company to submit some of its concession areas in the western part of Jerusalem and to extend its concession period by some extra 40 years. The company operated several small diesel generation units in Jerusalem, Ramallah and Bethlehem, with a power of 60 kilowatts each during the period from 1950 to 1954. The population benefiting from the electricity services in the district in 1952 reached 14,000. In Jerusalem, 24 per cent of the population was served, in Ramallah 20 per cent, and in Bethlehem around 3 per cent. 13/

In 1956, the municipalities of Jerusalem, Ramallah, Al-Bireh, Bethlehem, Beit Jala and Beit Sahur formed a corporation called Jerusalem District Electricity Company (JDEC). The previous private company agreed with the Jordanian government to submit its concession rights to JDEC, and to sell to it all its properties. In 1957, with the agreement of all parties, the newly formed corporation was granted expanded concession rights, which then included all the district. Jericho sub-district was included in the project; later high tension lines were extended to Jericho from Jerusalem. High tension lines were also extended to Bethlehem and Ramallah in 1958 and 1961, respectively.

The generation of electric power became economically feasible and more uniform when the central generation station in Shu'fat was opened in 1959, as larger and more efficient generating units were installed. 14/ First, two units were operated with light fuel, generating a total nominal power of 1,100 kilowatts. Economic benefits came from the increase in electric power generation and consumption levels, coupled with the higher unit price charged as against the lower generating cost which resulted from the lower operating costs of the new production units. While no data were available regarding

unsatisfied demand, it seems that increasing demand for electric power forced the company to add new generating units almost every other year. In 1967 the eight available units, most of which utilized heavy fuel, provided total nominal power of 11,760 kilowatts serving 19,240 subscribers. During that same year, total units generated reached 27.7 million kilowatt-hours, representing a four-fold increase over the level eight years earlier. 15/ Consumption was mainly for domestic purposes, although industrial consumption of electricity was increasing over time, with more factories being established.

In Nablus district, electricity services began when the municipalities of the major towns in the district established their own electric power stations during the 1950s. Before that, services were not uniform and were mainly supplied through small generation companies or small privately owned generators. Overall, less than 5 per cent of the total population of the district had electricity services by the mid-1950s.

Nablus had uniform electricity services as of 1957, when the municipal electricity project was put into operation. Before that, electricity was supplied by private company generators. Less than 25 per cent of the population of the town had electric illumination services at that time. 16/ The municipal generating station began operation in 1957, utilizing four small diesel units, with a total capacity of 900 kilowatts serving around 1,300 subscribers. 17/ Industrial consumption at that time was very low, with, for example, the average consumption per factory ranging from 1,200 to 2,400 kilowatts per year. 18/ The increasing demand for electricity forced the municipality to expand the project continuously. The newly purchased generating units were operated utilizing heavy fuel. By the end of 1966, the total nominal generated power was increased to 3,540 kilowatts, almost a four-fold increase compared to that generated 10 years earlier. 19/ By that time, the total number of subscribers was 9,120, most of whom were domestic consumers. 20/

Work was initiated in Jenin to construct a generating station as well as an electricity grid in the town in 1957. Previously, electricity had been supplied on a small scale through individual or collective units. In 1957, two small units began operation utilizing light fuel, and another unit was added in 1961/62 to bring the total capacity to 390 kilowatts. 21/

Uniform electricity services began in the town of Tulkarm in 1953. A small generating station was operated with a small engine utilizing light fuel. Only 11 per cent of the town's population was served by electricity when the project began. The project was expanded to meet increasing demand. By 1966, with four other generating units, also utilizing light fuel, the total nominal generated power reached around 1,100 kilowatts. 22/ The structure of the service was mainly geared to domestic (more than 90 per cent) and commercial purposes.

Electricity services were limited in Hebron district to a very small number of individual families through the operation of private generating units. In the town of Hebron in 1952, less than 2 per cent of the total population had uniform electricity services. 23/ The electricity industry in the district began with Hebron municipality in 1954 utilizing small diesel generating units. Two more units were added in 1958, then another

in 1962. 24/ Total electricity output reached about 2,000 kilowatts. The electricity project served the neighbouring small town of Halhul as well.

2. The Gaza Strip

Electricity reached Gaza Strip in 1935 through a transmission line of 22,000 volts extended from the central part of Palestine under British mandate. In 1948, owing to the war, electricity links with Israel were disconnected. Private companies began generating electricity after the purchase and operation of the first unit which had a total nominal capacity of 80 kilowatts. The private Gaza Electric Company founded in 1950 administered the electricity project and purchased a number of extra generating units. 25/ Most of Gaza city was linked to the electricity grid. The Egyptian authorities gave the company administration over the low tension network and facilities in 1955.

By 1967, these units were generating a total of around 1,000 kilowatts. Extra generating units were imported and utilized. Other large communities such as Deir Al-Balah, Rafah, Khan Yunis and Jabalia had separate generating units. Before 1967, each of these communities was supplied by a single generator of around 300 kilowatts. Less than 10 per cent of the total number of households had some kind of electricity services. All the electricity generated by these municipalities was for domestic use and street lighting purposes. Industrial projects generated their own required electricity using diesel units.

C. **Sewerage**

Sewerage utilities before 1967 were limited to the main cities of the West Bank and Gaza Strip. Even for those cities served by sewer mains, services in all cases were only for some parts. The rest of the population in urban areas, as well as the population of rural areas, built their own septic tanks for sewerage disposal. There were no sewerage treatment facilities in any of the cities of the West Bank or Gaza Strip. Collected sewerage was dumped into neighbouring wadis without any treatment.

In refugee camps, there had been no form of waste water management systems. In most cases, sewerage was disposed of in the alleyways of the camps, creating pollution and posing health hazards. There were neither treatment plants nor sludge disposal facilities before 1967.

Some efforts had been made since 1910 to construct waste water collection systems in the cities of the West Bank. Projects were initiated to install waste water mains in parts of such cities as Jerusalem, Bethlehem and Nablus. Wells were dug and septic tanks were built for the areas not served by waste water collection systems.

More cities and towns installed waste water collection systems under Jordanian rule. Services were expanded to cover more of the cities which already had waste water systems. However, municipalities were not able to implement sewerage treatment systems, mainly because of lack of funds and planning and owing to conditions of underdevelopment.

There was no waste water collection system in the Gaza Strip until 1967, except in the city of Gaza. The city had a public sewerage system, about 25 kilometres long, that serviced only the old part of the city. Residents elsewhere used different types of dry and wet wells, with or without septic tanks. By 1967, the public sewerage system was servicing almost half the residents of the city.

D. Refuse collection

Refuse collection consists of gathering and disposing of refuse and solid wastes. The collection services and the disposal of solid waste in urban areas have always been the responsibility of municipal councils. Such services have been practised since 1917, and were deemed one of the major responsibilities of municipalities. Sanitation workers collected domestic refuse daily and transported it to transfer sites. The only equipment used in the process consisted of transport vehicles carrying solid wastes from transfer sites to garbage disposal locations. The only treatment of the solid waste was by incineration. In refugee camps, the responsibility for these services was undertaken by UNRWA.

In villages, there were no organized efforts for the collection and disposal of solid wastes. However, refuse from each house or group of houses was dumped at a nearby site and sometimes treated by incineration. Such practices created serious health hazards. In general, people were not fully aware of public health and environmental concerns.

E. Slaughterhouses

Prior to 1967, public slaughterhouses were established in eight of the cities and major towns of the West Bank and Gaza Strip. Slaughtering services for other towns or rural areas were either provided in a neighbouring location, where a slaughterhouse existed, or outside slaughterhouses. Nablus slaughterhouse, for example, was constructed on the outskirts of the city during the 1920s. A special statute was issued by the municipality to organize the aspects of the services provided, including inspection, slaughtering and fee collection. There has been no expansion or major improvement in the conditions of the slaughterhouse since that time. Services have been provided through manual slaughtering. No treatment of the waste was available. 26/ In the Gaza Strip, slaughterhouses have been located in Gaza and Khan Yunis.

F. Public markets

Public wholesale markets have existed in major cities in the West Bank since the 1920s. They served the agricultural and trade sectors in providing a marketplace for the selling and buying in bulk of fruits and vegetables. The major regions had their own small central wholesale markets. Markets were established in Jerusalem, Nablus, Tulkarm, Jericho and Gaza.

The main West Bank wholesale market in Nablus was founded in 1922 on the outskirts of the city. A special statute was issued by the municipality in 1966 to organize the operation of the market. The area of influence of the market was extended to include all Nablus district. Owing to the expansion of operations in the market, and to the increase in population and the built-up

area in Nablus, the municipality decided to expand the market. Work began on the construction of the new and larger facility just before 1967, but owing to the war, expansion was temporarily halted. 27/

G. Public safety

The municipalities in the West Bank and Gaza Strip began establishing public safety departments in the 1950s. These departments were given responsibility for fire-fighting, rescue and first-aid operations. Public safety departments were founded in major cities such as Nablus, Jerusalem, Hebron and Gaza.

The Nablus department was founded by the municipality in the late 1950s. A location was chosen in the centre of the city, where a facility was constructed. The number of workers in the department was less than 10 and there was one vehicle used for fire-fighting. 28/ The department activities, especially in fire-fighting, covered almost the whole of Nablus district, as well as the Jordan valley.

Chapter II

THE STRUCTURE AND PERFORMANCE OF PUBLIC UTILITIES IN THE WEST BANK AND GAZA STRIP SINCE 1967

This chapter examines the development of public utilities in the West Bank and Gaza Strip, after their occupation in 1967 by Israel. Until 1967, some of the basic public utility services were expanded to reach most of the urban areas in the West Bank and Gaza Strip, in addition to a few rural communities. Further development of these utilities was not facilitated under occupation. However, Palestinian local authorities (municipality and village councils) and private institutions, made efforts to upgrade the quality and expand the range of services. Each utility is examined in terms of scope, structure, performance, capital formation, cost and pricing, and management along regional administrative divisions.

A. Water

The cities and towns of the West Bank and Gaza Strip expanded after 1967. The 1990 population of the occupied Palestinian territory was about 1.726 million as compared to 0.976 million on the eve of occupation. 29/ This increase, combined with the yearly per capita increase in water consumption, has considerably increased the demand for water. Water demand exceeds water supply, as shortages are observed in many locations, especially in summer.

The West Bank has a total annual renewable water capacity of 850 mcm, of which around 580-600 mcm are groundwater; Gaza Strip has a total groundwater capacity of 80 mcm/yr. 30/ Although other estimates exist for water capacity, these figures have been adopted as they are based on investigations by Palestinian researchers. Most of the groundwater capacity for the West Bank and Gaza Strip is withdrawn and utilized by the Israelis, so far without recognition of the Palestinian people's right to overall ownership and utilization of their water resources. In 1990, the amount of water transferred from the West Bank and Gaza Strip to Israel was estimated at between 514 and 528 mcm/yr, while that transferred from Israel to the West Bank and Gaza Strip was about 0.60 mcm/yr. This latter may be broken down as follows: 31/

Water transferred from the West Bank and Gaza Strip to Israel consists of:

- 15 mcm/yr as groundwater pumped by Jewish settlers in the West Bank;
- 10 mcm/yr as Jordan River water withdrawn by Jewish settlers in the West Bank;
- 14-28 mcm/yr as groundwater pumped by Jewish settlers in the Gaza Strip;
- 475 mcm/yr as groundwater withdrawn in Israel from West Bank aquifers.

Water transferred from Israel to the West Bank and Gaza Strip consists of:

- 0.51 mcm/yr from Jerusalem municipality to Ramallah Water Authority;

- 0.09 mcm/yr from Israel to the boundary villages of Shuqba, Qibia, Tura Al-Garbieh, Al-Jalameh and Ein El-Beida.

There are no official Palestinian organizations responsible for the regulation and management of the water environment (water resource exploitation and management, water-quality control and protection, and water supply). Full and direct control of these activities rests in the hands of the Israeli occupation authorities. However, the basic daily services of water supply in the West Bank and Gaza Strip are managed and controlled by the municipalities, regional water authorities, and village officials, as well as by the West Bank Water Department.

A number of municipalities in the West Bank and Gaza Strip have established departments for water and public health. The water departments of the local municipalities are responsible for the planning, development, management and operation, and maintenance of the water distribution systems and water resources owned and/or rented by the municipalities. Current practice of municipal water departments is limited to operation and maintenance of existing water distribution systems. In some cases, groups of municipalities have cooperated in solving common water problems. For instance, the Jerusalem District Water Authority Undertaking-Area of Ramallah, serves Ramallah, Al-Bireh, Birzeit, and 40 other villages and refugee camps. The Bethlehem Water Authority serves Bethlehem and a number of surrounding towns, villages and refugee camps. About one fourth of all the villages in the West Bank and Gaza Strip have local village councils. Village councils are responsible for the initiation and development of public services in the village including water supply and primary health services. In villages without local councils, local committees are usually formed to look after the public welfare of the village community.

The West Bank Water Department is an extension of the Jordanian Authority of Natural Resources which was in service in the West Bank until the 1967 war. Currently, the Department is managed by a Palestinian engineer under the direct supervision and control of the Israeli officer in charge of water. After 1967, the Israeli occupation authorities had transferred the management of all water resources in the West Bank from the Water Department to the Israeli water company, Mekorot. The tasks and responsibilities of the Water Department were reduced to the collection of water bills from local municipalities and village councils, in addition to some minor technical office work. This includes receiving applications for new water distribution systems from local municipalities, village councils and/or committees, commenting on the nearest water source, and communications with the Israeli officer in charge of water.

A number of United Nations agencies, such as UNRWA and UNDP, and non-governmental organizations (NGOs) such as SCF, CRS, AMIDEAST, Central Mennonites, ANERA, ICA and others, provide financial and technical assistance

to local communities, especially in rural areas, in the West Bank and Gaza Strip, in the fields of public health, water supply, and wastewater collection.

There are no water-quality monitoring programmes and treatment processes in use for any urban or rural area in the West Bank or Gaza Strip. There is no awareness of the relevance of these activities by the municipalities or water authorities.

This section presents the conditions of water utilities since occupation in 1967, covering such aspects as: range and structure of service; investments, costs and pricing; and management and performance.

1. The West Bank

Current water consumption for domestic use is estimated at 30.558 mcm/yr for the West Bank as follows: 32/

- 17.926 mcm/yr for cities and towns;
- 7.432 mcm/yr for villages with water networks (encompasses 62 per cent of the total rural population);
- 3.500 mcm/yr for villages with no water networks;
- 1.700 mcm/yr for refugee camps.

Details of water consumption for respectively urban and rural areas of the West Bank classified according to source are presented in tables 2 and 3. The cities and towns (i.e., those urban communities which have municipal councils that administer public services within their boundaries) number 25 in addition to east Jerusalem. Each has its water distribution system. The total consumption of the cities, including east Jerusalem, reaches 16.073 mcm/yr while that of the towns amounts to 1.853 mcm/yr. 33/

Table 2 indicates that water sources for cities and towns of the West Bank are distributed as:

- 41.8 per cent from municipal or regional authority wells;
- 3.5 per cent from private wells;
- 10.5 per cent from local springs;
- 7.7 per cent through the West Bank Water Department;
- 21.0 per cent through the Israeli company Mekorot;
- 15.5 per cent from Jerusalem municipality.

Water supplied by the Israeli company Mekorot is produced by the company from water wells inside the West Bank.

Regarding rural areas, the study of Haddad and Abu-Eisheh 34/ considers 351 villages, representing rural communities with more than 100 inhabitants in general, out of the total of around 400 villages in the West Bank. There are 176 villages with installed water distribution systems, representing around 50 per cent of the villages studied. In these villages, there is around 355.3 thousand inhabitants out of around 537.2 thousand inhabitants living in rural regions. Water consumption in villages which have water distribution systems reaches 7.432 mcm/yr. The consumption rates for the rest of the villages, which do not have water distribution systems, are estimated to be 75 per cent of that for which there exists a distribution system. Total water consumption for these villages is estimated at 3.500 mcm/yr.

Table 3 indicates that for rural communities in the West Bank which have water networks, water consumption is distributed by sources as:

- 35.3 per cent from municipal or regional authority sources;
- 8.1 per cent from private wells;
- 3.3 per cent from local springs;
- 33.1 per cent through the West Bank Water Department;
- 20.2 per cent from the Israeli company Mekorot.

Palestinian refugee camps located in the West Bank are generally supplied with water from municipal sources. Most of the camps have an installed distribution system. Total water consumption by these camps is currently estimated to be 1.700 mcm/yr. 35/

(a) Jerusalem district

(i) East Jerusalem

The Israeli authorities renewed the old pipeline bringing water from Ras El-Ein in the west. In order to supply the Israeli settlements built after 1967 in east Jerusalem (e.g., Romima, Telbiot, Ramat Ashkoul, and the French Hill), most of the six-inch distribution pipes were replaced with 10 and 12-inch gauge, increasing the capacity of the system by 0.75 mcm annually. In 1969, a borehole was drilled within the municipal boundaries with an annual capacity of about 3 mcm. Because of the ban on information concerning east Jerusalem by the Israeli authorities, no information is available about the development of the water distribution system or future Israeli water plans for the city.

The Israeli municipality of Jerusalem supplies the Palestinian residents of east Jerusalem with water. Current annual water consumption in east Jerusalem is estimated at 2.687 mcm. Consumption in the rural parts of Jerusalem sub-district reaches 1.686 mcm/yr, supplied by Ramallah Water Authority and Mekorot. This would result in an average per capita consumption of water for Palestinians living in east Jerusalem of 52.6 litres per capita

per year, based on the population as presented in table 1. This is much lower than the average per capita water consumption in Israel, which reaches 143.30 cubic metres per capita per year. 36/

(ii) Ramallah

Several development plans have involved making changes to the water distribution system. Since 1967, four reservoirs have been built. The water distribution system was connected to two agricultural wells. 37/ During the past 10 years (1980 to 1990), the Ramallah Water Authority has installed water distribution systems and established new services to more than 20 extra towns and villages within the sub-districts of Jerusalem and Ramallah. The total number of subscriptions as of 1990 was 20,085 (in 48 towns, villages, and refugee camps with a total population of around 178,800). Water consumed in the Ramallah/Al-Bireh urban area amounts to 1.415 mcm/yr. 38/

Local water resources, owned by the Authority supply a total of 2.972 mcm/yr. This includes 0.580 mcm/yr for urban areas in Ramallah sub-district, and 1.458 and 0.934 mcm for rural areas in Jerusalem and Ramallah sub-districts, respectively, as indicated by tables 2 and 3. The Authority buys the rest of what is required from the Israeli company Mekorot and from Jerusalem municipality. The difference between the total volume of water pumped through the system and the metered volume is 1.60 mcm/yr which is considered as system leakages and losses (about 26 per cent). The Authority found that the reasons behind this high rate of leakage and loss in the water distribution system are: (a) deterioration of water pipes (responsible for 53.0 per cent of the loss), (b) inaccuracy of water meters (responsible for 41.1 per cent of the loss), and (c) consumer malpractice (responsible for 5.9 per cent of the loss). 39/

A board of directors administers the Authority, consisting of six representatives from the served municipalities and villages. The Authority employs 120 persons, including engineers, technicians, clerks, accountants and computer experts. The cost of water production per cubic metre from owned wells reaches JD 0.237, while it reaches JD 0.445 for that purchased from the Israeli company Mekorot. 40/ The price per cubic metre is currently JD 0.700 for consumers. 41/

(iii) Bethlehem

After 1967, the Israeli military authorities took full control of Batn Elgoul No. 1 well and drilled another two boreholes, Batn Elgoul No. 2 and No. 3, with capacities of 355 and 300 m^3/hr, respectively. In 1974, the Bethlehem Water Authority sponsored a development study of the water distribution system done by the Israeli company Tahal. 42/ This study recommended a three-phase plan. Phase one involved the immediate replacement of all old water mains and the installation of new ones in the areas under development so as to satisfy water demand, in addition to building water reservoirs and drilling boreholes. Phases two and three involved drilling more boreholes and expanding the water distribution system. The total number of boreholes to be drilled in the development plan was 13. Most of the works planned for phase one have been completed, but part of phase one and the other two phases have been delayed, mainly owing to lack of financial support.

At present, there are five wells supplying the consumers of Bethlehem Water Authority, Hebron municipality, and Jewish settlements in the area. In addition, Bethlehem district is connected to the Jerusalem water distribution system. One of these wells was drilled before 1967 and owned by Bethlehem Water Authority. The other four wells were drilled after 1967. All are controlled by the Israeli authorities represented by the Mekorot water company. There are no available data concerning the distribution of water between the Palestinians and the Israelis. Water withdrawal rates from these wells to the Bethlehem water distribution system can reach a maximum of 1,300 m^3/hr. Water consumption in the city reaches 1.252 mcm/yr. 43/

(iv) Jericho

In 1977, a development plan for the water supply system was put into effect. The plan included replacing the old diesel motor and pump with a new automated motor and a booster pump, supplying the Ein El-Sultan station with electricity, installing a new water distribution system, and building a water reservoir with a storage capacity of 2,500 m^3. About JD 900,000 were invested in this plan by Jericho Municipality.

Currently, the number of subscribers to the water system is about 2,000; another water reservoir is being built with a storage capacity of 500 m^3. Total water consumption from municipal sources reached 0.245 mcm in 1990. According to municipality officials, one cubic metre costs JD 0.35. The municipality charges consumers JD 0.15/m^3, in effect subsidizing water supply with other municipal income sources. 44/ Many families have their own water wells and do not rely on municipal sources.

(b) Nablus District

(i) Nablus

In 1969, the Israeli occupation authorities drilled a borehole, Badan No. 1, at a depth of 748 m producing a capacity of 200 m^3/hr. This well, after many petitions and negotiations, was rented to the municipality in 1972. In 1979, a borehole was drilled in Al Fara'a, Badan No. 2, at a depth of 400 m and with a capacity of 430 m^3/hr. This borehole began operation in 1987. The two wells at Deir Sharaf ceased operation in 1982 and 1986. 45/ The municipality requested permission from the Israeli authorities to drill a new borehole nearby, but deeper than the previous two wells. Although the Israeli authorities promised to give permission for drilling years ago, it has never been granted.

The water springs in the city supply 1.629 mcm/yr while the municipality wells supply 2.851 mcm/yr. To fulfil the water demand, the municipality currently buys 0.116 mcm/yr of water from Beit Eiba's well which is owned by the Israeli military authorities represented by Mekorot. 46/

Currently, there are 11 water reservoirs and structures, with a total estimated value of JD 203,000. The equipment which includes motors and pumps at the seven spring and well locations are valued at JD 1,034,000.

The water sources owned or rented to the municipality have an estimated value of JD 222,000. Finally, the extended mains and distribution pipes have a value of JD 3,500,000. 47/ Funding of all of these elements came from the financial resources of the municipality.

In 1990, the number of water department subscribers reached 19,000 and the amount of water consumed was about 4.6 mcm/yr. Because part of the water distribution system and most water meters are very old, leakages and losses in the system were estimated to be about 57 per cent. 48/ These losses are mainly owing to deterioration of the water mains, high pumping pressures, and improper hydraulic operation and control of the system. One cubic metre is now being sold for 0.6 JD while its cost exceeds 1.0 JD. The cost elements include pumping station electric power representing 50.2 per cent of the total, administrative costs (1.2 per cent), wages (26.6 per cent), depreciation on equipment and structures (18.8 per cent), maintenance (1.1 per cent), fuel (1.6 per cent), and other costs (0.5 per cent). The utility is being subsidized from other municipal resources. This issue will be thoroughly discussed and analysed in the next chapter.

(ii) Jenin

A water supply well was drilled near the town of A'rabeh with a depth of 300 m and capacity of about 300 m^3/hr. A study sponsored by Jenin municipality and conducted by the Israeli company Tahal concluded that potential water resources are located to the west of Jenin in the area of Kufur Adam and Ein Al-Futain. The military commander of Jenin district refused several requests (1980-1982) by Jenin municipality to drill wells in those areas. After 1967, two pumping stations were installed in the system, one water reservoir has been built, while another is under construction. Currently, Jenin municipality suffers acute shortages, even after the drilling of the well near the village of Jabaa'.

Leakages and losses in the water distribution system are estimated to be about 25 per cent to 30 per cent of the pumped water volume. The same reasons for the high rates of losses as presented above also hold for Jenin. Water costs the municipality about JD 0.65 m^3 (i.e., JD 0.57/m^3 water department price plus JD 0.08/m^3 operation and maintenance cost). Jenin municipality charges JD 0.70/m^3.

(iii) Tulkarm

Following the increased demand for water, the municipality had drilled and operated a third well in 1972, as the total capacity of the two old wells was limited to 140 m^3/hr. The wells are Shweikeh well (100 m deep), Tulkarm old well (130 m), and Al-Fadelieh well (130 m) with a total pumping capacity of 230 m^3/hr. 49/ The pumping stations were modified to run by electrical motors directly, thus improving efficiency, maintenance and operating procedures.

In addition to the city of Tulkarm, the municipality supplies water to the three surrounding suburbs as well as to two refugee camps. The distribution system includes two reservoirs in Tulkarm and three reservoirs

in the suburbs. The only treatment process provided is disinfection using chlorine gas. Losses and leakages in the distribution system, as estimated by municipality engineers, were at least 30 per cent.

Each summer the city suffers from a shortage in water supply. This shortage was estimated in 1988 to be about 150,000 m^3. Water shortages have been overcome by buying water from surrounding agricultural water wells. Currently, the number of subscribers is around 7,000. Total water consumption reached 2.253 mcm in 1990. More than 90 per cent of water consumption is for domestic use, including that used for watering citrus orchards inside city limits. Until 1987, water was sold to consumers for JD 0.23/m^3. Since 1988, water is being sold for about JD 0.35/m^3 for all uses. 50/ This low price is owing to the fact that water wells are owned by the municipality and are located within the municipal boundaries with limited pumping heads (because of the low elevation of the town).

(c) Hebron District

(i) Hebron

Water supply changed little until 1975, when a new water reservoir was built with a capacity of 3,879 m^3. The water to the new reservoir comes from Herodiun wells located in the Taqou' area in Bethlehem sub-district. According to a study undertaken by the Israeli company Tahal and sponsored by the Hebron municipality, present water consumption is estimated to be 2.53 mcm/yr. 51/

Estimated water losses and leakages in the system are 50 per cent to 60 per cent. According to the municipality's water engineer, these losses are partly owing to leakages through deteriorated pipes (up to 40 per cent) and illegal use (up to 15 per cent). Currently, the municipality charges a price of about JD 0.75/m^3. No data are available on costs.

2. The Gaza Strip

In the Gaza Strip, water demand increased sharply, while water supply decreased both in quantity and quality. At present, water consumption for domestic purposes reaches 21.61 mcm/yr, and 2.06 mcm/yr for industrial purposes. Water for agricultural purposes is estimated at 65.00 mcm/yr. 52/ All water is supplied from groundwater sources. The distribution by area of the total water withdrawn for domestic and industrial purposes is given in table 4. Water losses and leakages in water distribution systems range from 20 per cent to 29 per cent.

(a) Gaza

Groundwater is the main source of water supply. The number of wells has increased to 16 in 1990 with a total capacity of 45,000 m^3/day. Of these, 31,500 m^3/day were used for domestic and 13,500 m^3/day for industrial purposes. The number of subscribers increased to 35,000 including those of Al-Shati' refugee camp. Old wells have been redrilled and most wells have been equipped with electric pumps operating 22 hours daily. 53/

(b) Rafah

The number of wells had been increased to four with a capacity of 360 m^3/hr, but recently an old well ceased operation. The system includes two other wells under the control of UNRWA, with a capacity of 110 m^3/hr. Asbestos pipes were installed with diameters of 14 inches and less. Three reservoirs are in service with a storage capacity of 2,420 m^3. 54/

(c) Deir El-Balah

After 1967, another well was drilled with a capacity of 60 m^3/hr. Later, two other wells with similar capacities were drilled, bringing the number of wells to four. Lately, two wells have ceased operation. Total water withdrawal is 300 m^3/hr and the number of subscribers reached 300. Another water reservoir was built with a capacity of 1,000 m^3. 55/ The old water reservoir is still in operation.

B. Electricity

Israeli measures, after the occupation of the West Bank and Gaza Strip in 1967, were aimed at controlling electric power and other vital socioeconomic sectors, rendering them dependent on the Israeli economy. The development of the existing electricity generation projects was retarded with the aim of linking the major towns and villages of the occupied territory with the national Israeli grid. This was confirmed through the rejection of requests to the authorities by the Palestinian electricity producers to import the spare parts required for the maintenance of their generating units, or to purchase and import new units.

1. The West Bank

Electricity supply in the West Bank comes from the municipal electric power stations, the Jerusalem District Electricity Company (JDEC) and the national Israeli grid through the Israel Electric Corporation (IEC). In addition, small diesel generators also supply electricity in some of the villages. Major electric power sources in the West Bank include the only running power station in Nablus with current total power of 9.6 megawatts and the station of the JDEC, which was generating close to 18 megawatts before it stopped generating electricity in 1988. The Israeli grid is connected through high tension lines of 7.5 and 5.5 megawatt amperes. 56/

Since the production of electricity by the JDEC was discontinued in 1988, the company purchases all its electricity from the IEC. As such, the company serves merely as a distributor of purchased electricity to consumers in the Jerusalem district. Nablus has been partially supplied from the Israeli corporation since 1985. All the other cities and major towns in the West Bank are now supplied by electric power from the national Israeli grid. The municipalities of these cities and towns became distributors of purchased electricity to their residents. For the small towns not connected with the national Israeli grid, such as Silfit, efforts are being made to connect them owing to mounting pressures as well as the inefficiency and financial losses of the existing generating facilities.

In 1985, 46.4 per cent of Palestinian village houses in the West Bank had regular electricity supply while 41.0 per cent were supplied with electricity for at least a few hours a day. 57/ Currently, in the rural areas of the West Bank, there are more than 200 generators, of around 0.25 megawatts each, serving villages. A survey of the largest 351 villages in the West Bank, with a population of 100 inhabitants or more, shows that around 80 per cent of these villages have some sort of electricity distribution network.

The source of electricity supply to those Palestinian villages in the West Bank which have electricity distribution networks is as follows:

- 33.0 per cent of the villages are supplied from the JDEC;
- 3.7 per cent of the villages from Nablus municipality;
- 16.0 per cent of the villages from the IEC;
- 28.0 per cent of the villages from their own generators;
- 19.3 per cent of the villages are partially supplied by private generators owned by individuals.

(a) Jerusalem District

The JDEC continued to supply the area within its concession (i.e. the Jerusalem district, including east Jerusalem) since 1967. After occupation, the company tried to expand its concession limits to include Hebron district, as the Jordanian Government had issued a draft law in 1967, just before occupation, granting the company the right to expand its concession. The Israeli occupation in 1967 came before the completion of the legal process and official ratification of the draft law. A legal dispute with the Israeli Government broke out over the right of the company to expand, which ended with an Israeli High Court decision in 1972 forbidding the company from supplying Hebron district with electricity. 58/

The company served the Israeli settlements constructed after occupation and within the company's concession limits. This began in 1968 when the IEC prepared to supply electricity to the first of these settlements, Ramat Eshkol, located north of Jerusalem. The company's desire to serve the Israeli settlements, was motivated by the fear that if they had let the settlements connect to the Israeli grid, the company's rights to supply electricity within its concession limits might have been prejudiced in future. This policy consequently paved the way towards the undermining of a viable Palestinian national institution.

The rapid growth of those settlements around east Jerusalem, especially in the first few years of occupation, and the accompanying increase in electricity loads, coupled with the inability to expand the generation capabilities of the company or buy new generating units owing to lack of financial resources, pushed the company towards a supply crisis. Two generating units with a total capacity of 10 megawatts were added during the years 1971 and 1972, giving the company a total nominal capacity of 21.76 megawatts by 1972. However, owing to deterioration of old generating units, it actually supplied only 17.60 megawatts. 59/

While consumption was increasing at very high annual rates (61.1 per cent for 1972), the capacity to supply was limited. The company was thus obliged to disrupt electricity services alternately to the various communities within the concession limits. The company was finally forced to link with the national Israeli grid by the end of 1972 through connections in three locations in the network. Since that time, the company has purchased from the IEC the shortfall between the electricity required and that produced.

In 1980, generated units reached a maximum of 86.00 million kilowatt hours, while the purchased units reached 151.10 million kilowatt hours. The total generated and purchased units represents more than a three-fold increase with respect to that of 1972. 60/ Although the consumption of electricity had increased at a high rate of around 15 per cent per annum, the quantity and share of the generated power out of the total (generated and purchased) began to decrease sharply as from 1980, owing to technical and financial problems. The company generated only 10.00 million kilowatt hours in 1988, the last year in which it produced electricity; it purchased 318.40 million kilowatt hours. During the same year, the power station supplied 1.30 megawatts only, or just 6 per cent of the total nominal capacity of the generator units. 61/

The company purchased five new generators in 1983 to replace the old ones. The total nominal generating power of the new units is 17.5 megawatts. Although construction of the foundations of the largest units began immediately, the Israeli authorities ordered the discontinuation of construction, claiming that the company had not received the required authorization. Financial problems halted construction work on the other four units. 62/

The Israeli authorities claim that emission rates for gases from the power station would be higher than the allowable rates and would pose a pollution hazard. The company asked an Israeli consultant to check the claim, and found that the emission rates would be within allowable limits. 63/ The authorities then requested construction of a tower 30 metres high for effluents.

The inability of the company to pay accumulated bills to the IEC provided the excuse to ask the company to give up its concession to supply Israeli settlements within the district in 1988. 64/ As a result, the company's board of directors decided to stop generating electric power as from the beginning of 1989. The electricity units purchased from IEC were 375.00 and 374.40 million kilowatt hours for 1989 and 1990, respectively. 65/ The number of subscribers in the four sub-districts increased from 19,248 in 1967 to 62,100 in 1980 and 85,050 by the end of 1990. 66/

The big Palestinian industrial subscribers (with electricity services of more than 100 amperes) increased in the district from 1,380 in 1980 to 1,840 in 1990. No data are available on such numbers before 1980. Israeli settlers' subscriptions increased to 23,780 in 1980 and reached 29,348 by the end of 1987, compared to the total number of Palestinian subscriptions of 75,652. However, the number of settlers' subscriptions dropped in the following year to 4,018 owing to the disconnection of services to most settlements.

Data indicate that the number of Palestinian subscribers had increased four times since the occupation; they reveal clearly the wide coverage of service, especially since electrification of Palestinian villages. The escalating increase in the number of Israeli subscribers had alarmed the Israeli Government and this was one of the motives behind its decision to limit the company's concession. The increase in the overall number of subscribers (five times since 1967), accompanied by the inability of the company to generate the required electric power and be self-dependent, prevented it from developing to a level that would enable it to provide excellent quality service; this led finally to the company becoming an agent for distributing electricity purchased from the IEC.

The overall structure of the electricity services in the district between 1980 and 1990 indicates that the share of electric power consumption for household use represents 50 per cent; for trade and small-scale industrial use 22.4 per cent; for big industrial use 10.0 per cent; for agricultural-related uses 1.0 per cent; for water-pumping stations 6.6 per cent; for street lighting 5.0 per cent, and 5.0 per cent reserved for peak hour loads. 67/

The company began to sink into financial crisis since linking up with the IEC. The JDEC was forced to sell electricity at the same price as the Israeli Corporation, 68/ owing in part to government subsidization of IEC prices. These were considerably lower than the prices set previously by the Jerusalem company.

The company's pricing policy, as set by the Israeli authorities, led to losses. The cost per unit of generated electricity was much greater than that of purchased electricity, and exceeded the price per unit of electricity sold. Data show that, for example, in 1983, the average sale price per unit was 3.291 Israeli shekels (IS), while the cost per purchased unit was IS 3.149 and the cost per unit generated was IS 5.887. In 1984, the average sale price per unit was IS 15.373, while the cost per unit purchased was IS 13.470, and the cost per unit generated was IS 32.020. In 1985, the average sale price per unit was IS 70.929, while the cost per unit purchased was IS 61.762, and the cost per unit generated was IS 138.85. 69/

The higher cost per unit generated in relation to the unit sale price resulted in a total loss of IS 247.52 million (or around US$ 4.62 million) in 1983, IS 751.02 million (or around US$ 2.53 million) in 1984, and IS 2,480.79 million (or around US$ 2.356 million) in 1985. 70/ The company took loans from banks at high interest rates, and was granted aid from other sources, including the Jordanian-Palestinian Joint Committee.

The high cost per unit generated is owing to the vintage of the diesel generators and their high consumption rates of fuel. The maintenance costs for these units were high. During the last year of operation of the generating station, in 1988, the total cost per unit generated was NIS 0.277 as compared to that purchased from the IEC at NIS 0.127. The variable cost of the purchased unit was found to be NIS 0.094. The company was selling the electricity at an average weighted unit price of NIS 0.101. A detailed analysis regarding cost and pricing is presented in the next chapter.

By the beginning of 1989, and after the disconnection of most of the Israeli settlements, the Israeli authorities allowed the company to increase

the sale price of the unit by 24 per cent, but not for the electricity sold to Israeli consumers. Therefore, the Palestinian subscribers were effectively subsidizing the company. However, the increase in price just covered the daily operating costs, without allowing the company to restart the generators or enhance its quality of service.

In 1990-1991, the price per kilowatt hour (including the 24 per cent increase) was NIS 0.217 (or about JD 0.060) for domestic purposes, and NIS 0.220 (or about JD 0.063) for industrial use. In 1990, the cost per unit purchased reached NIS 0.200. 71/

The rural areas of the district are linked to the electricity grid of the JDEC. The current average overall consumption of electricity for a representative sample of villages in the four sub-districts indicates that in the rural area of Jerusalem sub-district, the average consumption per subscriber is 186.3 kilowatt hours per month; in Ramallah sub-district, 142.4; in Bethlehem sub-district, 130.7; and in Jericho sub-district, 208.3 kilowatt hours per month. 72/

Peak loads in the Jerusalem district show more than a six-fold increase over the 12-year period 1968 to 1980, from 7.41 megawatts to 49.6 megawatts. 73/ The increase in the peak load mounted sharply until 1987, reaching a maximum of 106.00 megawatts. The peak load dropped to 72.20 megawatts in the following year, when most of the Israeli settlements were disconnected from the network. The peak load reached 75.60 megawatts during 1990. 74/

Losses in the system reached a peak value of 73.4 million kilowatt hours, compared with total distributed units of 507.0 million kilowatt hours in 1987. These losses form around 14.5 per cent of total power. This share is considered high, as compared to internationally accepted level of losses of up to 5 per cent. These mainly consist of transmission losses caused by the inefficiency of the old and overloaded electricity grid. There is no appreciable effort oriented towards the remedy of the situation, as this would require extra expenses which the company could not bear. Black losses have increased recently, especially during the intifada period because of the lack of control, and the absence of authority in general.

The company is currently managed by a board of directors, which consists of the heads of Palestinian municipal councils in the district and elected members from the Palestinian shareholders. The JDEC as a joint stock company has 75,000 shares each with a nominal value of JD 10,000. 75/ There have been no elections by the shareholders since 1967 although some members of the board of directors have retired. The Head of the company's board of directors is deputized as the company's general manager vested with all authority. Management has not been able to run the company in a successful manner, and many decisions have been inadequately and sometimes incorrectly taken.

The current total number of employees in the company is around 340. 76/ The company is organized into two sections, technical and administrative, with 160 and 180 employees, respectively. In the technical section, there are seven engineers. Training programmes which are important in fields such as energy management are limited. In 1990, only one engineer and three technicians benefited from these programmes.

(b) Nablus District

(i) Nablus

The Jordan Electric Authority law, legislated in 1965, urged the establishment of Nablus Electric Corporation with a concession area including all Nablus district. The Israeli authorities have not recognized this law, thus preventing the formation of the corporation. Electricity continued to be produced by the municipality, as before 1967. In 1967, the power station in Nablus supplied 3.54 megawatts. The Israeli authorities have turned down many requests to develop and expand the electric power station in Nablus.

The municipality was not allowed to import the necessary spare parts for the electricity generating units. The physical depreciation of these units has rendered supply non-uniform, and obliged the municipality to cut electricity several hours each day. Shortage in power supply was marked during the period 1972-1974. However, owing to mounting public and municipal pressure, more generating units were added in 1974 and 1979 with a nominal capacity of 4.80 and 0.92 megawatts, respectively. Total nominal power supplied reached 9.14 megawatts in 1979. 77/

In an attempt to control electricity supply in the occupied territory, many requests from the municipality to purchase new generating units have been turned down. Included among the obstacles was delay in responding to requests. Finally, in 1981 upon great insistence Nablus municipality was granted permission to import and operate three new diesel units using heavy fuel, each supplying 4.70 megawatts. Total nominal generating capacity jumped to 23.5 megawatts. The municipality constructed a facility to house the new generation units. The total cost of the project was around JD 1.7 million. 78/ The project was funded by Palestinians abroad and by grants from some Arab countries.

Subsequently and in accordance with the increased severity of policies towards the Palestinians, the Israeli authorities firmly rejected attempts by the municipal council to import the required spare parts necessary to operate and maintain both the old and the new generating units. This brought the operation of two old units to a halt; they had been supplying 4.5 megawatts. The forced dissolution of the elected municipal council and the appointment of Israeli military officers in charge of the municipality in 1982 hindered the operation of the electricity project. Maintenance of older vintage units lapsed under direct Israeli control.

In 1984, the Israeli authorities linked the town of A'nabta and some villages to the west of Nablus, which had previously been supplied by the municipality, with the national Israeli grid. In 1985 the western and eastern suburbs, and some other villages, were gradually linked with the national Israeli grid.

Since linkage to the national Israeli grid in 1984, the quantity of locally generated power has decreased continuously, while that purchased from Israel has increased rapidly. Total power generated in 1984 was 49.51 million kilowatt hours (96.4 per cent of the total), while that purchased was 1.84 million kilowatt hours, compared to total power generated in 1990 of 26.64 million kilowatt hours (39.3 per cent of the total), and

41.10 million kilowatt hours purchased. 79/ The main reason for the decrease in generated electric power was insufficient maintenance of the older generating units. The growing needs of the population can be depicted through the increase in the number of subscribers which increased from 10,770 in 1970 to 20,070 in 1980 and 26,660 by the end of 1990. 80/

Hourly peak loads of the main generating station show an increase from 3.1 megawatts in 1973 to 5.6 megawatts in 1980, and to 6.3 megawatts in 1989. Peak loads of the two stations connected with the Israeli grid were found to be 9.2 megawatts in 1989. Electricity losses in the system reached around 15 per cent of the total power produced and purchased, mainly owing to transmission losses. 81/ These losses are caused by the inefficiency of the old overloaded distribution grid. There is no appreciable effort oriented towards remedying the situation, as this would imply extra costs. Moreover, there is an extra 3 to 5 per cent loss which is considered as black loss. These losses have increased recently, especially during the intifada period.

Owing to age and insufficient maintenance, the generating units consume abnormally high rates of expensive fuels. As a result, the cost per unit produced is much higher than the cost per unit purchased. Currently, the generating cost per kilowatt hour is JD 0.068, while the general production cost is JD 0.105. The cost per kilowatt hour purchased from the IEC is JD 0.060 at present, almost 57 per cent of the respective generating cost. The price per kilowatt hour increased from JD 0.025 for household use and JD 0.020 for industrial use in 1967, to JD 0.068 at the time of connection with the Israeli national grid in 1985. The current price is now almost double: JD 0.110 for the first 50 kilowatt hours and JD 0.140 per additional unit for domestic purposes. Figures for industrial and trade uses are JD 0.100 and JD 0.120, respectively. 82/

An analysis of generating costs over recent years shows that the share of each of the cost elements is as follows: 83/ fuels 75.7 per cent; salaries 4.1 per cent; maintenance, 13.7 per cent; depreciation, 5.4 per cent; and miscellaneous costs, 1.1 per cent. Fuels are the main cost item with the production of each kilowatt hour requiring around 0.25 kg of fuel, costing JD 0.079. An analysis of general production costs shows the following shares: fuels, 66.0 per cent; salaries, 9.1 per cent; maintenance, 13.1 per cent; depreciation, 7.6 per cent; and miscellaneous, 4.2 per cent.

The total number of employees in the electric utility of Nablus municipality is 185. 84/ The department is organized into two sections, technical and administrative. The number of employees per section is 134 and 51, respectively. The technical section comprises eight engineers and 126 technicians. Training programmes are very limited, with only one technician benefiting from such a programme since 1980.

(ii) Jenin

During the period 1969-1974, the increasing demand for electricity had led the municipal council to expand the existing electricity project. Five generating units were added, bringing the total to nine, with a total nominal power output of 2.64 megawatts. These conditions lasted until 1980 when,

owing to lack of maintenance and restrictions on importing necessary spare parts, the power supplied by these units dropped to 1.45 megawatts. The peak load during 1980 reached 1.20 megawatts. 85/

With the refusal of the Israeli authorities to grant permission to import new generating units or spare parts for the old units, in the face of increasing demand for electricity the municipality was obliged to agree to linkage with the national Israeli grid. The municipality also supplies a nearby village, Burqin.

Currently, total units purchased from the IEC by the municipality amount to 15.00 million kilowatt hours. The number of subscribers is 5,750, including 460 industrial subscribers. The department of electricity includes the administrative section with a staff of nine, and the technical section with one engineer and nine technicians and other workers. The price per kilowatt hour is JD 0.100, with purchases from the IEC costing JD 0.06 per unit. 86/

(iii) Tulkarm

In Tulkarm, no expansion in generation capacity has taken place since 1967. This is owing to the unsettled political conditions after the 1967 war and the rejection by the Israeli authorities to allow the import of necessary spare parts to maintain the generating units. The demand for electric power has increased, as has the cost per unit generated, owing to expensive fuel and spare parts from the black market. Such factors forced the municipal council to cede to the pressures exerted by the Israeli authorities to link with the national Israeli grid in 1974 through a 22 kilovolt high tension line. 87/

Currently, total units purchased from IEC amount to 19.68 million kilowatt hours. The number of subscribers is around 8,000, with the majority (more than 90 per cent) constituting households and trade subscribers. The municipal electricity network has been expanded to reach a small number of communities outside the boundaries of the town, including one village. The electricity department of the municipality consists of two sections, the administrative, with a staff of 11, and the technical, with one engineer, five technicians, and around 20 other workers. 88/

(c) Hebron District

(i) Hebron

The municipal electricity generating station did not expand from 1962 to 1970. Later, because of increasing demand for electricity owing to increasing population and growing needs, the municipal council planned for the development of the power plant. The municipality asked permission to import new units and spare parts, but all such requests were rejected by the Israeli authorities. Finally the municipality was forced to agree to link with the national Israeli grid beginning in 1973. 89/

Since connection to the Israeli grid, electricity supply has been able to meet increasing demand. Currently, the number of subscribers is

around 17,500, of which around 1,500 are industrial subscribers. The total units purchased from the IEC had reached 49.52 million kilowatt hours during the year May 1990 to April 1991. 90/

The Hebron Department of Electricity is headed by an engineer and consists of technical and administrative sections. The price per kilowatt hour is currently NIS 0.37 (or JD 0.106) for domestic use and NIS 0.32 (JD 0.091) for industrial use. The cost per unit purchased is NIS 0.21 (JD 0.060). 91/

2. The Gaza Strip

After the 1967 war, the municipalities of the Gaza Strip were linked with the national Israeli grid, owing to the inability of the old generators to produce the required electric power. The municipalities were neither allowed nor able to import the required spare parts or new generating units. In Gaza city just before occupation, there were three old units supplying a total of 850 kilowatts. Now, the total annual electricity consumption for the whole Gaza Strip is estimated at 220 million kilowatt hours.

The connection with the Israeli grid was carried out for the whole of Gaza Strip by the IEC a few months after occupation. This was executed through the extension of 22 kilovolt high tension lines to the Gaza Strip. 92/ The electricity supply has satisfied the constantly growing demand in the whole of Gaza Strip. Household consumption has risen appreciably; factories have replaced their old diesel machines with electric powered machines. By 1985, around 94.0 per cent of households in the Gaza Strip (including refugee camps) had regular electricity supply. 93/

The following sections describe the status of electricity utilities in the city of Gaza and in Deir El-Balah.

(a) Gaza

According to Gaza Municipality engineers, the current total annual consumption of electricity is estimated at about 120 million kilowatt hours for the city of Gaza and the neighbouring Al-Shati' refugee camp. This represents around 55 per cent of total consumption for the whole Gaza Strip. For the city, this is considered to be equivalent to a total generated power of about 24.0 megawatts. 94/

The number of subscribers is currently close to 30,000, of which 28,500 are domestic and trade subscribers, and 1,500 industrial. For the industrial subscribers, the electric current reaches 30-60 amperes in general, and up to 400 amperes in some cases. Gaza municipality supplies most of the 15 water well pumping stations and all the seven wastewater pumping stations. Since connection to the Israeli grid, Gaza Municipality has served only as an agent for the distribution of the electricity purchased from the IEC. The municipality's department of electricity is responsible for maintaining the electric utility facilities in the city and Al-Shati' refugee camp. The department is also responsible for building the required transformers and expanding the grid to connect new subscribers. The department has a staff consisting of five engineers, and 30 technicians, and 10 persons work in administrative jobs. 95/

The price per kilowatt hour is currently NIS 0.24 for household use and NIS 0.27 for industrial use. The cost per kilowatt hour is around NIS 0.17, as purchased from the IEC. The difference between the cost per unit purchased and the unit sale price just covers daily operational expenses.

Among the problems that face the municipalities, is the insufficiency of transformers in the system, as some lines extend for 3 km from the transformer to the subscriber. Sometimes, loads on transformers are greater than their design capacities. The IEC was notified about these problems, but currently and especially during the intifada, they did not appear to be motivated to improve the quality of electricity services.

Black losses form a considerable problem as well. Such losses are estimated to represent 10 to 15 per cent of the electricity distributed, mainly owing to inefficient management and lack of control, especially in the period of the intifada.

(b) Deir El-Balah

The town was linked to the Israeli grid after the 1967 war. Currently, there are 3,300 subscribers in the town. Of these, around 250 subscribers are considered to be either industrial users or private well operators. The 1990 electricity load was equivalent to around 2.0 megawatts. The price per kilowatt hour was set at NIS 0.30 for domestic use and NIS 0.28 for industrial use. The cost per kilowatt hour purchased from the IEC was NIS 0.20. 96/

C. Sewerage

Since 1967, sewerage collection systems have been expanded or rebuilt in most of the urban areas of the West Bank. 97/ New collection systems were installed in unserviced towns of the Gaza Strip. Wastewater treatment facilities were constructed in a number of cities in the West Bank, including Jenin, Tulkarm and Ramallah.

1. The West Bank

There is no sewage collection system in the rural areas of the West Bank, except for the village of Bir Nabala. The village raised a fund of JD 320,000 to finance the project. Work on the installation of the system, which was initiated in 1986, lasted for two years. The village was only partially served by the project.

(a) Jerusalem District

(i) East Jerusalem

The sanitary services along with other services of the city were linked with those of west Jerusalem after the 1967 war. Since that time, the Israeli Municipality of Jerusalem has run the sewerage services. Over 85 per cent of the population in east Jerusalem is served by sewer mains. The rest of the population uses septic tanks for wastewater disposal. The collected raw wastewater flows to a regional sewage disposal site where it is treated.

(ii) Ramallah

A wastewater collection and disposal system for the city of Ramallah was originally designed in 1970 and modified in 1984. The city is divided into eight sectors from which the raw wastewater is collected in 12-inch sewage conduits. Owing to the local topography, five pumping stations pump the wastewater to a treatment plant located south-west of the city near the municipal industrial zone. The treatment plant consists of two primary settling tanks and two aeration tanks.

Currently, about 75 per cent of the city's population is connected to the sewer mains. The remaining 25 per cent uses septic tanks for wastewater disposal. After treatment, the wastewater flows out to a nearby wadi. No wastewater re-use practice is reported. Although the municipality does not monitor the wastewater treatment plant, a recent study found plant efficiency to be very low, especially in bacterial dissimilation and suspended solid removal. 98/ Almost no changes in wastewater quality occur after being treated. The study recommended that plant processes be redesigned.

(iii) Bethlehem

In the Bethlehem area, only 20 per cent of the population is connected to sewer mains. This system was first installed in 1918. The wastewater collected by sewers flows to a wadi near Bethlehem where it is used in irrigation without any treatment. This could cause the spread of pathogenic diseases and the destruction of soil by increasing its solids and salt content. The remaining 80 per cent of the population uses septic tanks. The septic tanks are emptied using special sanitary trucks which dispose of their loads in a wadi near Beit Sahur.

A plan to construct a wastewater collection and disposal system for the Bethlehem area, including Bethlehem, Beit Sahur, Beit Jala, and the refugee camps of Aida, Dheisheh, and Azza, has been sponsored by the UNDP and the Governments of Italy and Germany. Actual construction has begun. The estimated cost of the project is US$ 5.66 million. The collected flow will be biologically treated before being discharged to a wadi from which it will flow to the Dead Sea.

(iv) Jericho

There are no sewer mains in Jericho. All the town's inhabitants use septic tanks for wastewater disposal. Because of Jericho's sandy soil, the raw wastewater percolates through the soil, thus possibly polluting the groundwater aquifer. The extent of this potential pollution is not known since no measurements have been taken. The hot climatic conditions in the town would delay the occurrence of such pollution, but not eliminate it.

(b) Nablus District

(i) Nablus

Today, 75 per cent of the city's population is connected to sewer mains. Because of the city's topography, 58 per cent of the collected wastewater (about 7,200 cubic metres/day) flows westward for discharge without any

treatment into a wadi along the Tulkarm road on the outskirts of the city. The remaining 42 per cent of the city's wastewater (about 5,500 cubic metres/day) flows towards the east and is discharged into Wadi As-Sajour, near Askar, without treatment. The major portion of the existing sewers operates as a combined sewer, where domestic wastewater is collected along with rain and storm water in one system.

The eastern part of the city is served by 20-inch sewer pipes while the western part is served by a 40-inch pipe that leads to an outlet along the Tulkarm road. In 1973, a study was prepared for wastewater treatment of Nablus sewerage. 99/ The study proposed two treatment schemes, one for the eastern part, and another for the western part. The schemes could not be implemented because of a conflict over the ownership of land needed for the project. Although Nablus Municipality is contemplating the design of a wastewater treatment plant, no definite future plans concerning wastewater management are available.

(ii) Jenin

About 60 per cent of the town's population is connected to sewer mains. The coverage consists mainly of the downtown area, east of the main Nablus road, behind the shopping centre and the municipality building. The collection system consists of concrete pipes of 6 to 12 inches in diameter, and a square concrete duct along the main road in the downtown area. Portions of the existing sewerage system in the downtown area work as a combined system carrying domestic sewage and storm water. After being collected, the wastewater flows to a settling basin, and then by gravity to the west where it is used by farmers for irrigation without any treatment. The unserved 40 per cent of the population uses either septic tanks or sub-drainage systems for wastewater disposal.

(iii) Tulkarm

In Tulkarm, only 50 per cent of the population is connected to sewer mains. The remaining 50 per cent uses septic tanks for wastewater disposal. After being collected, the wastewater flows by gravity to the west where it is allowed to settle in two settling ponds 105 to 130 metres in length, 30 to 32 metres in width, and 3.5 metres in depth. The wastewater is then pumped to a nearby Israeli colony where it is treated and re-used in irrigation.

(c) Hebron District

(i) Hebron

In Hebron, about 65 per cent of the population is connected to sewer mains. The wastewater collection system is made of asbestos cement pipes, 8 to 32 inches in diameter. The total wastewater flow is estimated at 7,200 cubic metres/day. After being collected, the wastewater passes through a primary settling basin before flowing into nearby wadis towards the Dead Sea.

2. The Gaza Strip

The extent of the wastewater disposal problem is greater in the Gaza Strip than in the West Bank owing to the fact that about 65 per cent of the population lives in refugee camps without wastewater management systems. Projects in the refugee camps for wastewater management during the past 40 years have been negligible, being merely temporary measures.

For the rural areas of the Gaza Strip, there exists a project in Beit Lahia and Jabalia. Wastewater is collected in pipes and then pumped to six oxidation ponds north-east of Beit Lahia. Plans for re-using the effluent in agriculture are being implemented.

The refugee camps represent the most unfavourable living and environmental conditions. Public latrines are still in use in some of the camps. The system of private latrines, some of them with small pits, represents a significant health hazard. Frequent overflowing causes the contamination of lanes, streets, and neighbourhood property.

(a) Gaza

The only wastewater collection system in which most of the population is connected to sewer mains is in the city of Gaza. The system, around 50 kilometres long, collects about 27,000 cubic metres/day of domestic sewage. The first phase of a stormwater collection system has been completed. A UNDP project for wastewater treatment and re-use in agriculture and/or replenishment of groundwater aquifers is under construction. The treatment schemes consist of three stabilization ponds located to the east of Sheikh Ejleen. Currently, the collected wastewater flows into the Mediterranean. About 100,000 inhabitants will benefit from the project, which serves an area of about 3,240 hectares; it will process 4.0 mcm/yr. The estimated cost of the project is US$ 5.22 million.

(b) Khan Yunis

The town has a new central sewage collection system with the support of PVOs. Wastewater flows to a collection area to the east of Qarara village, where it is used in irrigating citrus trees. However, work has begun on the construction of a new treatment facility to serve the whole region.

(c) Rafah

A piped wastewater collection and oxidation pond treatment system was constructed in 1987, sponsored by an international NGO. The pond has an area of 15 dunums and a wastewater volume capacity of 30,970 cubic metres. Because of poor maintenance and high input of solids, significant sludge has accumulated in the pond, reducing its performance. Nothing has been done to solve the maintenance problem.

D. **Refuse**

This utility includes the collection and disposal of domestic solid waste. In the occupied Palestinian territory, these services are the responsibility of municipal and village councils. Although the numbers of

sanitation workers in most cities seem adequate, individual workers in most cases lack general education and appropriate training in solid waste handling. There has been an improvement and modernization in the collection of refuse, with most of the municipalities purchasing modern vehicles. 100/

1. The West Bank

Table 5 illustrates the status of solid waste handling services in the major urban centres of the West Bank. Landfills are generally small in size; they can be as small as 4 dunums, as in Tulkarm. Nablus produces the maximum tonnage of refuse: about 240 to 300 tons/day. In large villages, solid waste collection is managed by local village councils. Collected refuse is dumped nearby, but not officially certified as landfill. In smaller rural areas, the collection and disposal of solid waste is managed by individual households.

(a) Jerusalem District

(i) East Jerusalem

Solid waste services, along with all other municipal services of east Jerusalem, became part of those of west Jerusalem after the city was annexed by the Israeli occupation authorities in the aftermath of the 1967 war. Solid waste collected from east Jerusalem, amounting to about 200 tons daily, is sent to a central landfill 10 kilometres east of the city which is expected to serve until 2005. In addition, three transfer stations serve the city, with one located in east Jerusalem.

(ii) Ramallah

About 20 tons of solid waste are collected daily and hauled to the municipal landfill, which has an area of 6 dunums. The municipal landfill has been in use for more than 35 years. Residential and industrial zones have crept to within distances of about 400 metres and 200 metres from the landfill, respectively. The only treatment of the solid waste is incineration. Residents in the surrounding areas complain of air pollution. It is recommended that a new landfill be constructed respecting the city's urban development, landscape and environmental quality.

(iii) Bethlehem

Solid waste from Bethlehem, Beit Jala, Beit Sahour, and the surrounding refugee camps, which amounts to about 25 tons/day, was formerly hauled to a landfill in El-A'zaria. However, the municipality of Jerusalem recently prohibited the use of El-A'zaria landfill for the disposal of solid waste from the Bethlehem area. Currently, the solid waste is collected using compacting storage trolleys and then hauled to the Jerusalem landfill.

(iv) Jericho

Solid waste collected from Jericho and the surrounding refugee camps, which amounts to about 15 tons/day, is hauled to an open area owned by the Jericho Municipality in Wadi El-Kult. Because no specific area has been designated as a landfill, solid wastes are scattered over a relatively large area.

(b) Nablus District

(i) Nablus

The amount of solid waste collected daily in Nablus ranges from 240 to 300 tons. This waste is hauled directly to a sanitary landfill east of the city. The landfill is 13 dunums in area and is located about 300 to 500 m from residential zones. Children can often be seen in the landfill area searching for metals and other re-usable wastes.

The only treatment of solid waste is by incineration. The distance between the municipal landfill and some sections of the city is up to 7 or 9 km, thus increasing transportation costs and causing service delays. There are no transfer stations with a size reduction capability that would assist in reducing lost time and effort in the transport of solid waste.

(ii) Jenin

About 35 tons of waste are collected daily from Jenin and its refugee camp. In 1975, an area of 10 dunums east of the city was rented for use as a landfill. However, a Jewish settlement was built in the proximity of the rented area and authorities prohibited the Jenin municipality from using the designated site as a landfill. After several years, a permit was issued to the municipality to construct a landfill 30 km east of the city. The distant location of the proposed landfill was both impractical and economically unfeasible. As a result, solid waste is being disposed of along the roads and in open spaces west of the city.

(iii) Tulkarm

Tulkarm and the surrounding villages and refugee camps produce about 60 tons of solid waste daily. The collected waste is hauled to a landfill, which has an area of about 4 dunums and is located 4 km east of the city. The landfill is very small and several layers of waste have accumulated. The only treatment of the solid waste is by incineration.

(c) Hebron District

(i) Hebron

The amount of solid waste collected daily in Hebron ranges from 120-180 tons. This waste is hauled to a sanitary landfill located 15 km east of the city. The landfill is 40 dunums in area and is expected to serve the city until the year 2000. Incineration is the only treatment provided. However, residents of the surrounding villages complain of noxious gases emitted from the landfill.

2. The Gaza Strip

Refuse collection and disposal is performed by municipalities and village councils. In refugee camps, UNRWA is responsible for these services. The amount of solid waste collected in Gaza city ranges from 400 to 500 tons per day. The municipal landfill which is a 50-dunum lot leased by the municipality is located south-east of the city. The city has a mixed system

of waste collection and disposal employing a fleet of vehicles, including roll-on and mechanical compaction trucks, in addition to a number of tractors and earth-moving equipment.

E. Slaughterhouses

There has been an increase since 1967 in the number of slaughterhouses operated by the municipalities of the West Bank and Gaza Strip. Currently, there are slaughterhouses in the following cities and towns of the West Bank: Nablus, Jenin, Tulkarm, Qalqiliah, Ramallah, Al-Bireh, Jerusalem, Jericho, Bethlehem, Beit Sahur, Beit Jala, and Hebron. There are smaller slaughterhouses in the towns of Tubas, A'nabta, Ya'bad, Silfit, Deir Dibwan, and Bani Zaid. In the Gaza Strip, slaughterhouses exist in the city of Gaza and in Khan Yunis, Deir El-Balah, Rafah, and the village of Beit Lahia. The reported number of livestock slaughtered in slaughterhouses in the West Bank (not including east Jerusalem), reached 88,340 head in 1986/87. 101/ The figure reached around 14,520 head in the slaughterhouses of the Gaza Strip. A survey of the services in a number of these slaughterhouses revealed that 40 per cent of the registered slaughtering is performed in rural areas and in locations outside the slaughterhouses. 102/ There is no monitoring for slaughtering outside the municipal slaughterhouses. According to the same study, the proportion of slaughtering outside the slaughterhouses in the Gaza Strip is smaller than that in the West Bank.

The operations and services of slaughterhouses in the West Bank and Gaza Strip are similar. Nablus slaughterhouse, for example, had not expanded since 1967 until very recently. The procedure of slaughtering had not improved appreciably. It should be noted that not all slaughtering is performed in the slaughterhouse, as a number of butchers perform slaughtering outside the existing facilities, owing to the inability of the municipality to monitor the process under the present circumstances.

The staff working in the slaughterhouse includes a veterinarian, two meat inspectors, and two accountants. There is a fee of JD 1.5 collected for each slaughtering. The municipality grants the rights of fee collection to individual guarantors for a total of around JD 20-25 thousand per year. 103/ Slaughtering continues to be carried out manually, but an air compressor has been added in order to facilitate the process. There is no special treatment of the waste material and blood resulting from the process. The solid waste is hauled to the nearby refuse disposal landfill. Liquid waste, including blood, is discharged in an open space nearby.

However, in 1987, the municipality began a project funded by an international NGO for the expansion and modernization of the existing facility. 104/ The capacity of the expanded facility will be double than that of the existing one, with room for a future expansion of 50 per cent. The project includes plans for four production lines for mechanical slaughtering operations and the construction of huge meat refrigerators. The project is funded by ANERA.

Another example of slaughterhouses may be found in Gaza city, which serves both the city and Al-Shati' refugee camp. At present, the slaughterhouse operates at full capacity of 50 head/day. 105/ Some slaughterings are also carried out outside the slaughterhouse owing to the

lack of inspection by the municipality and poor control under the present conditions. The operations are performed manually by butchers. Seven persons work in the facility, including two veteranians and one meat inspector. A fee of 2.5 per cent of the value of the slaughtered animal is collected. A plan to construct a new modern facility is now being executed, to be equipped with mechanical slaughtering facilities and a total capacity of 200 slaughtered animals per day.

Since 1987, some developments in slaughtering facilities have occurred. An old slaughterhouse has been put into service anew in Khan Yunis. A new slaughterhouse was constructed in Al-Bireh which serves the whole Ramallah/Al-Bireh region. The latter has special treatment facilities for liquid wastes including blood. 106/ These developments should increase the capacity of slaughterhouses considerably.

F. Public Markets

There have been expansions in many wholesale markets since 1967, owing to the increase in their operations. Several factors underlie this increase, including an increase in crops and the opening of new active markets for the exchange of products between the West Bank and Gaza Strip on the one hand, and between them and Israel on the other. A number of new markets have also been built by municipalities in the occupied territory, such as those of Tulkarm, Bethlehem, and Deir El-Balah.

The development of one of these markets, Nablus, may be cited as an example. Although construction of the new wholesale market on the outskirts of the city began before 1967, it was finished in 1968. The marketplace includes 45 shops, in addition to around 12 dunums of open space. The operation of the new market by the municipality actually began two years later, as merchants considered its location to be relatively distant compared to the old one. This market eventually became the largest in the West Bank in its scale of operation, as it serves all the northern region in addition to marketing the agricultural products of the Jordan River valley, and a share of the Gaza Strip production. The current average daily volume of marketed agricultural products reaches about 200 tons. Around 800 to 1,000 light and heavy trucks enter the market carrying products each day. 107/ The volume was even greater before 1988, as many more products from more distant regions (e.g., the Gaza Strip), were transported to the market. The number of workers in the market reached 34 prior to the intifada, but dropped subsequently to only 13.

A project, funded by UNDP, is now under way to expand the central wholesale market by the addition of 32 shops to the existing 45. This will increase the capacity of the market considerably. The project, also envisages space for other shops not related directly to the wholesale market operations.

The tariff on each wholesale agreement is set at 4 per cent of total value. The municipality does not collect the fees directly, but grants a contractor the right to collect the fees, for an amount previously agreed upon. The system of contracting seems to be reliable, with the municipality generating from the market revenues estimated at JD 240,000 in 1989.

G. Public Safety

Public safety utilities include three major services: fire-fighting, rescue and first-aid operations. There has been an expansion in the operations of the public safety departments in the cities of the West Bank and Gaza Strip, mainly owing to the increase in population. New departments have been formed by municipalities in some cities and towns which were previously obliged to obtain such services from neighbouring cities. Examples include the public safety departments of Tulkarm and Qalqiliah in the West Bank, and Deir El-Balah in Gaza Strip. The development and operation of one of these departments, in Nablus, is presented as an example. After 1967, the numbers of vehicles and personnel were increased to satisfy the rising need. Currently, the staff numbers around 30, in addition to 10 part-time workers, equipped at an acceptable level. The number of vehicles was increased to three fire-fighting engines. Services are provided 24 hours a day for the Nablus sub-district, as other towns in the district have their own public safety departments. In the old quarter of the city, where big vehicles cannot enter the narrow streets, fire-fighting services are provided by 10 fixed water hydrant units.

The department provided services in around 250 cases in 1986. 108/ More than 85 per cent of these cases involved fire-fighting. Services are provided without charge. A plan to build a new and larger public safety department in a more convenient location began to be implemented in 1987. However, owing to present conditions and financial problems, work has stopped. The total cost of the new construction is estimated to be around US$ 700,000. 109/ Other plans prepared by the municipality include the purchase of three more vehicles equipped for fire-fighting, a crane for rescue operations, an emergency vehicle, and an hydraulic ladder.

Chapter III

AN ASSESSMENT OF THE ADEQUACY AND EFFICIENCY OF EXISTING PUBLIC UTILITIES IN THE WEST BANK AND GAZA STRIP

The adequacy and efficiency of existing public utilities in the West Bank and Gaza Strip are analysed in this chapter. It is mainly based on the findings of chapter II, which described various aspects of these utilities. Other relevant data and information are also presented. The dimensions considered here include: (a) supply and demand considerations in urban and rural areas; (b) investment and capital formation; (c) contribution to the economy; (d) cost, finance and pricing policies; and (e) manpower and technology factors. Each factor is discussed separately for each of the utilities considered. For lack of data, representative examples are depicted in the analysis, where possible.

A. Supply and demand considerations

1. Water

Shortages of information on the quantity and quality of water available for Palestinians in the occupied territory at present make it difficult to assess the water environment in the region. The inadequacy and inefficiency of existing water utilities, as discussed in the previous chapter, may be characterized by poor planning, limited exploitation of water resources, uneconomic costing and pricing policies, limited extent of services in rural areas, high losses and leakage, lack of storage tanks, and deteriorating water quality. 110/ Another major problem is the lack of an established national central institution to develop a comprehensive plan for adequate and efficient water supply.

Water demand is not fulfilled in most cases. Shortages in water supply to meet demand are most obvious during the hottest season, when tapped water runs only a few hours a day or once every few days. The shortage is apparent from the existence of water tanks on the roofs of all houses almost everywhere.

Water demand is appreciably higher than actual water consumption. Data on the relation between demand and consumption are available only for Nablus which may nevertheless be considered representative of urban areas. Engineers in the water department of Nablus Municipality estimate current water demand at 7.154 mcm/yr as compared to total consumption of 4.596 mcm/yr. 111/ Therefore, water demand is 55.7 per cent higher than water consumption in the city. If the same ratio is applied to other urban areas in the West Bank (no such information is available for other urban areas), total demand would reach 27.903 mcm/yr as compared to total consumption of 17.926 mcm/yr. This is so despite the fact that the total annual renewable water capacity is estimated to reach 600 mcm for the West Bank. For Gaza Strip, total demand is estimated at 36.854 mcm/yr compared to actual consumption of 23.670 mcm/yr.

In rural areas, shortages in water supply are obvious. Around 50 per cent of villages in the West Bank, where a total population of 221.8 thousand lives (some 38.5 per cent of the total rural population) do not

have water distribution systems. Even in villages with water distribution systems, water supply is not enough to fulfil demand for domestic use. Citizens drill their own water collection wells and purchase water from transporter tanks, especially in summer.

Overall, in the West Bank, Palestinians control 55.3 per cent of their water sources in urban areas and 46.7 per cent of the sources in rural areas. The rest is administered by Israeli authorities, either directly through Mekorot and Jerusalem Municipality or indirectly, through the West Bank Water Department. In Gaza Strip, Palestinian local authorities (municipal and village councils), UNRWA, and individuals own the water wells.

Average water consumption for domestic purposes in urban areas of the West Bank increased from 14.4 to 32.4 cubic metres per capita per year from 1982 to 1990. In rural areas and in the villages with water distribution systems, water consumption for domestic purposes increased from 10.0 to 13.4 cubic metres per capita per year from 1982 to 1990. 112/ In Gaza Strip, the average water consumption for domestic purposes in urban areas is 40.8 cubic metres per capita per year, while that in rural areas and refugee camps is 28.5 cubic metres per capita per year. Overall, the average per capita consumption in Gaza Strip is higher than that in the West Bank because around 50 per cent of the villages of the West Bank are not supplied with water through water distribution systems, while in Gaza Strip all the villages have such water distribution systems. In addition, water resources supplying the Palestinians in Gaza Strip are owned and managed by the Palestinians and UNRWA.

Overall average water consumption for domestic purposes in the West Bank and Gaza Strip in 1990 was found to be respectively 28.0 and 37.2 cubic metres per capita per year. The per capita average water consumption for household purposes reached 23.8 and 34.0 cubic metres per year for the West Bank and Gaza Strip, respectively. 113/ Water consumption for household purposes in Israel was 109.6 cubic metres per capita in 1989; 114/ while that for Israeli settlements in the occupied territory was estimated at 90.0 cubic metres per capita per year. 115/ Domestic water consumption in Jordan for the same year was 53.0 cubic metres per capita. 116/

Water consumed by industry in the West Bank amounted to 15.2 per cent of the total water consumed for domestic purposes. 117/ This results in an average consumption of 4.3 cubic metres per capita per year. In Gaza Strip, water consumed in industry stood at 8.7 per cent of the total water consumed for domestic purposes, 118/ an average consumption of 3.2 cubic metres per capita per year. The average industrial consumption per capita per year in Israel reaches 33.7 cubic metres. 119/

Consumption rates in the occupied Palestinian territory are the lowest in the region. The consumption of the occupied territories is about five times less than that of Israel. The gap between consumption rates in the occupied Palestinian territory and Israel mainly reflects the effect of limitations and restrictions imposed by the Israeli authorities on the use and exploitation of water resources.

Regarding water supply sources administered by the local Palestinian authorities or regional water institutions, boreholes are mostly at limited depths and capacities. There is an urgent need for rehabilitation of existing wells and for drilling of new boreholes with greater depths and stable yields.

Owing to the age of the water distribution systems, the existence of faulty meters, and consumer malpractice, the rates of leakages and losses are high, exceeding 50 per cent in some cities in the West Bank such as Nablus, and about 30 per cent in Gaza Strip. Immediate measures are needed to reduce losses. In Jordan, leakage through the water distribution system reaches about 25 per cent. 120/

Regarding water quality, there are no water treatment measures utilized except the addition of chlorine for disinfection in some instances. Even this is not supervised by experienced personnel. The increasing salinity of water in Gaza Strip poses a real problem regarding water quality.

2. Electricity

The supply of electric power in the occupied Palestinian territory consists of locally generated power and purchased power from the IEC. Since occupation, the efforts of local Palestinian municipal authorities and the JDEC to expand and to import new generating units have been obstructed by the Israeli authorities, with the aim of linking these areas to the Israeli grid. Such linkage had been resisted by the Palestinians in fear that it would create a permanent political fact and would thwart the development of the Palestinian economy and infrastructure. The existence of obstacles facing the development of electricity generating stations, coupled with the increasing demand for electricity, forced the Palestinians to accept linkage. The linkage began in Gaza Strip a few months after occupation. Other areas were linked later, such as Jerusalem district which was partially linked in 1972, and Nablus sub-district which was partially linked in 1984.

The share of electricity generated in the total supply of electricity began to decline since the linkage of major towns with the IEC. A few months after occupation, electricity supply in Gaza Strip became totally dependent on the IEC. By the end of 1972, the share of electricity generated was about 55 per cent out of the total supply of about 99.0 million kilowatt hours in the West Bank. 121/ Currently, the total supply of electricity for Gaza Strip (which is still totally dependent on electricity from Israeli sources) is estimated at 220.0 million kilowatt hours. In the West Bank, the share of electricity purchased from the IEC is close to 95 per cent of the total supply in the West Bank (reaching 500.0 million kilowatt hours).

The only power station still operating in one of the cities of the West Bank, i.e., Nablus, supplies 9.6 megawatts. Nablus station generated a total of 26.6 million kilowatt hours. The demand for electricity in all other cities and most of the towns in the West Bank is met by electric power purchased from Israel. The JDEC, which supplies electricity to Jerusalem district, currently purchases all its electricity from the IEC.

An analysis of the evolution of the overall consumption rates of electricity shows that total consumption of electricity per capita per year in the West Bank increased from 33 kilowatt hours in 1967 to 139 kilowatt hours

in 1972, and reached 274 kilowatt hours in 1980. 122/ By 1990, total consumption per capita had increased to 462 kilowatt hours in the West Bank, while it was around 356 kilowatt hours in Gaza Strip. In Israel, the total consumption of electricity per capita was about ten times that in the occupied Palestinian territory and reached about 4,492 kilowatt hours during 1989. 123/ In Jordan, the total consumption of electricity per capita was just under three times that of the occupied Palestinian territory, reaching 1,114 kilowatt hours in 1990. 124/ This would imply that the demand for electricity in the West Bank and Gaza Strip is not completely satisfied.

Low consumption rates arise mainly owing to the fact that about 50 per cent of the rural population in the West Bank has no regular electricity supply or none at all. In addition, the non-household sectors, especially the developing industrial and services sectors, do not consume high rates of electricity. The share of household consumption in total electricity consumption currently reaches 50 per cent in some parts of the occupied Palestinian territory (the share in Israel is only 29 per cent). 125/

Over 98 per cent of the population in urban areas has regular electricity supply. Almost 95 per cent of the population in urban areas in Gaza Strip, including that of refugee camps within urban areas, is currently served by electricity around the clock. Regarding rural areas of the West Bank, around 80 per cent of rural communities have some sort of electricity network. 126/ The villages that are supplied by municipalities or by the JDEC amount to 36.2 per cent of the total number of villages with electricity distribution grids. Those supplied directly (from IEC) reach 16.0 per cent; the rest have generators that either serve the whole village or individual houses. Currently, about 50 per cent of the population of the villages has regular supply and close to 40 per cent is supplied for a few hours per day. Close to 95 per cent of the population of rural areas in the Gaza Strip, in addition to refugee camps, is currently served by electricity around the clock.

Electricity services are not completely uniform, as power disruptions suddenly occur and last for many hours. Moreover, many towns lack sufficient transformers and the electricity lines are overloaded. In rural areas, electricity supply is short in relation to demand. Only half of rural households have regular supply in the West Bank. Conditions differ in Gaza Strip, as around 95 per cent of residents have regular electricity services. This is mainly owing to the small area of the Strip and to the short distances between communities, unlike the West Bank.

The rate of increase in demand, reflected by the increase in consumption rates, in the cities and towns connected to the Israeli grid such as Hebron and Tulkarm, is higher than that in Nablus, which is only partially supplied with Israeli energy. For example, the consumption of electricity in Hebron jumped from 1.5 million kilowatt hours in 1970 to 19.2 million kilowatt hours in 1980. 127/ None the less, most of the electricity supply is not considered national, and therefore, this should be taken into account in planning towards future independent infrastructure and resources.

3. Sewerage

As noted, in most cities and towns there exist partial wastewater collection systems. In general, the share of the population of urban areas in the West Bank served by sewer mains ranges from 50 per cent in Tulkarm, to 85 per cent in Jerusalem. In a few other urban areas, either a small percentage of the population is served by sewer mains, such as Bethlehem where it reaches about 20 per cent, or not served at all, like in Jericho. As for rural areas, Bir Nibala, in Jerusalem sub-district, is the only village that has a wastewater collection system. In refugee camps, there are no wastewater collection systems whatsoever.

It can be seen that the existing sewer collection systems cannot fulfil the increasing demand arising from population growth. The absence of wastewater collection systems in rural areas indicates that the demand for this service utility is not satisfied at all in these areas.

There are no comprehensive treatment and/or recycling plants. Facilities for partial treatment exist in cities such as Tulkarm, Ramallah, and Gaza. Plans for wastewater management are limited. In most cases, collected wastewater is left to flow freely into valleys outside urban areas causing environmental damage. Farmers use untreated wastewater for irrigation, with implicit potential danger to the health of citizens.

The inadequacy of the sewerage system is mainly reflected in shortages in the extent of coverage of collection and treatment services. Moreover, there is no adequate planning for wastewater disposal either by municipalities or any other body. Neither are there data that would assist in the analysis of the evolution and development of the utility, or a comparison of supply/demand characteristics with other countries.

4. Refuse

According to available information on refuse collection and disposal in the occupied Palestinian territory, there has been little or no development in this sector over a long period. Like most other utilities, there are no specific plans for the development of refuse disposal and recycling in the occupied territory, including the establishment of volume reduction facilities, or sorting, disposal and recycling centres. In urban areas, the existing municipal refuse services suffer from shortages of containers, collection equipment, vehicles, and compaction facilities. In general, there is a lack of proper disposal sites. Refuse treatment practices are usually inadequate.

Often, services do not cover all the urban areas within municipal limits. Thus the demand for services is not totally met. Commonly, the few small containers available stand full of refuse most of the time. The collection process is not organized on a daily basis. Organized refuse collection services do not exist in rural areas except in a few larger villages, through the village councils.

The capacity of the old municipal landfills is limited. They are often within and/or close to housing areas. They should be expanded or replaced, especially those close to housing areas. In some urban areas, such as Jenin

and Jericho, collected refuse is not transferred to specified landfills, but scattered over a wide area. In most villages, refuse is dumped without control, posing health hazards.

There is furthermore an urgent need to control the incineration process in the existing landfills. This is the only treatment of solid waste in the occupied Palestinian territory. There are no sorting facilities for solid waste for possible re-use and recycling.

The inadequacy and inefficiency of public refuse utilities are reflected in the above-mentioned shortages, and in the limited coverage of collection and treatment services. No adequate planning or management for refuse disposal exists either by municipalities or any other institution. Data that would assist in the analysis of the evolution and development of the utility, as well as in the comparison of the supply/demand characteristics with other countries is lacking. However, the available data show that the total area assigned to landfills in the urban areas of the West Bank (except in east Jerusalem and Bethlehem) amounts to only 63 dunums, quite limited in the light of the estimated 497-572 tons of waste accumulated per day.

5. Slaughterhouses

Not all the existing slaughterhouses in the 18 cities and towns in the West Bank and the four urban centres and one village in Gaza Strip can be considered as typical slaughterhouses providing slaughtering services utilizing advanced facilities. Currently, around 40 per cent of registered slaughtering is performed outside the slaughterhouses. 128/ The latest available data on the number reveal that the figure reaches around 88,340 animals per year in the West Bank (not including east Jerusalem), and 14,520 per year in Gaza Strip.

In general, the number slaughtered per day is near or equal to the maximum possible slaughtering capacity in the occupied Palestinian territory. This is illustrated by the example of Nablus, where slaughtering totalled 40 calves and 150 sheep and goats per day; the slaughterhouse can accommodate 40 calves and 160 sheep and goats per day. A number of expansions or new construction projects are being executed to increase the capacity of the slaughterhouses as well as to modernize and mechanize them. Rural areas lack slaughterhouse facilities. Most slaughtering in rural areas is performed without such facilities. Moreover the vast majority of slaughterhouses lack the required treatment facilities for handling wastes. In addition, there is insufficient monitoring of slaughtering to confirm compliance with health standards.

6. Public markets

Public wholesale markets in the occupied Palestinian territory exist only in the cities and major towns, which serve their regional hinterland. The existing markets in urban centres, such as those in Nablus, Jericho, Bethlehem, Tulkarm and Gaza, form the main supply of public wholesale exchange services. The market in Nablus is considered the largest, with the highest share of the volume of commodity exchanges, reaching an average of 200 tons per day.

In order to meet the increasing demand for the exchange of agricultural products and to have more efficient services, some municipalities are currently working on expansion projects for a number of these markets such as those of Nablus and Tulkarm, or have newly established facilities, such as Bethlehem and Deir El-Balah.

There are insufficient data to assist in the analysis of the evolution and development of public markets in the occupied Palestinian territory.

7. Public safety

Public safety, which includes fire-fighting, rescue, first aid and emergency services, is provided through special departments established by the municipalities in the cities and towns of the West Bank and Gaza Strip. Each municipality, especially in large urban areas, has a public safety department equipped with a fleet of vehicles and employing trained staff. The rural areas, however, have no such utilities, as there is no public utility department in any rural community in the occupied Palestinian territory. Utilities are provided by neighbouring urban centres.

The services provided by these departments can be considered as satisfying the requirements for small-scale operations. For larger operations, assistance is provided from neighbouring centres and from Israeli departments; no regional public safety centres exist.

B. Investment and capital formation

Although most of the public utilities in the occupied Palestinian territory are managed and operated by local Palestinian municipal authorities and institutions, policies regarding the development of services provided through these utilities are controlled by the occupation authorities. This is evidenced by the fact that any new development project or any improvement of an existing one requires approval from the Israeli authorities. In most cases, the Israeli authorities have hindered or rejected such requests. Clear examples of obstructing the development of public utilities are the cases of the JDEC and Nablus municipal electricity project discussed earlier. As a result of Israeli policies, investment in public utilities has remained at low levels.

The capital investment in public utilities by the municipal authorities for the fiscal year 1987/88 is shown in table 6 for the West Bank and Gaza Strip. 129/ The data on the West Bank do not include data on east Jerusalem. The only available source of data is the Israeli Central Bureau of Statistics, where statistical data regarding east Jerusalem appears together with that of west Jerusalem. The total municipal capital investment in all public utilities for the fiscal year 1987/88 was NIS 12.63 million (US$ 7.56 million) for the occupied Palestinian territory.

Capital investment in public utilities for the West Bank was only NIS 7.97 million (US$ 4.77 million) for the year 1987/88. Investment in public buildings, including public markets, slaughterhouses and schools, accounted for the highest share of this expenditure (45.7 per cent), reaching NIS 3.64 million. In Gaza Strip, capital investment for the same year

was NIS 4.66 million (US$ 2.79 million), and again, investment in public buildings took the highest share of this expenditure (42.5 per cent), reaching about NIS 1.99 million.

The level of capital expenditure on public utilities in the occupied Palestinian territory is low in general, when per capita investments in these utilities are compared with other countries. The per capita investment in public utilities in the West Bank for the fiscal year 1987/88 was NIS 9.19 (US$ 5.50), while that in the Gaza Strip was NIS 11.76 (US$ 7.04). This ranges around only 6 to 7.7 per cent of per capita investment in public utilities in Israel which was NIS 151.93 (US$ 90.98). 130/ This disparity reflects the lack of attention by the authorities to the needs of the Palestinians in the West Bank and Gaza Strip, and a reluctance to allow Palestinians to develop public utilities and their economy as a whole in the West Bank and Gaza Strip. The percentage of the total investment in public utilities with respect to total public and private investments in the occupied Palestinian territory (which reaches NIS 864.00 million) was only about 1.5 per cent for the year 1987.

Capital investment in public utilities by the municipalities in the West Bank for fiscal 1988/89 reached a total of NIS 2.37 million, as compared to NIS 7.97 million for the previous fiscal year. 131/ This represents a decline of 70.3 per cent. This is mainly owing to reasons which have emerged since the beginning of the intifada. Many presidents and members of municipal councils in the occupied Palestinian territory resigned in protest at the beginning of the intifada, and this led to inadequate management in most of these municipalities. In addition, the many days of curfew imposed by the occupation authorities, hinder any attempt to implement previous plans. The budgets of the municipalities decreased as well, and the income of the municipalities from fuel and real estate taxes collected and transferred to them by the Israeli authorities dropped considerably. 132/ Table 7 shows the total capital investments in various utilities by the municipalities of the West Bank (excluding east Jerusalem) in 1987/88. The bulk of investment expenditure was effected in Hebron (31 per cent), while there was no such investment in Jericho. In Gaza Strip, capital investment in the city of Gaza formed 70 per cent of the total.

Private voluntary organizations (PVOs) in the West Bank and Gaza Strip have granted aid to the Palestinians to assist in the development of public utilities. Data for the period 1980 to 1985, show that PVOs assisted in the execution of development projects for such utilities as water, electricity and sewerage. Most of these projects were in rural areas.

Investment through PVOs in water supply projects totalled 2.27 and 2.68 million United States dollars in the West Bank and Gaza Strip, respectively. 133/ For rural electrification projects, investment was mainly in the West Bank where it reached US$ 0.58 million. PVO investment in wastewater utilities was mainly in the Gaza Strip, reaching US$ 0.14 million. The United Nations Development Programme (UNDP) had begun to support the development of Palestinian public utilities and other sectors in urgent need of assistance. During the period 1980 to 1991, UNDP invested a total of

US$ 11.47 and US$ 3.42 million in public utilities in the West Bank and Gaza Strip, respectively. 134/ UNDP invested US$ 3.28 million in water utility projects (of which US$ 3.22 million was invested in the West Bank and the rest in Gaza Strip); US$ 0.29 million in electricity projects in the West Bank; and US$ 11.32 million in wastewater projects (with US$ 7.96 million invested in the West Bank and the rest in Gaza Strip).

The sources of funds for investment in all development projects, including public utilities, for the fiscal year 1987/1988 are illustrated below for the local authorities in the West Bank and Gaza Strip. Again, the data on the West Bank do not include east Jerusalem. The major sources of funds spent on these development projects in the West Bank, which totalled NIS 11.42 million (US$ 6.84 million), included the Israeli authorities (NIS 7.52 million), the participation of local Palestinians (NIS 0.06 million), foreign grants and loans (NIS 3.04 million), and other sources (NIS 0.80 million). In Gaza Strip, major sources of funds for development projects, which totalled NIS 25.18 million (US$ 15.08 million) included the Israeli authorities (NIS 15.68 million), local authorities (NIS 8.78 million), foreign grants and loans (NIS 0.60 million), and the participation of local Palestinians (NIS 0.12 million).

The subsectoral analysis of various public utilities in the West Bank and Gaza Strip is presented below. Examples of financial analysis for water and electricity utilities are also illustrated.

Water

Investment in water utility projects in the West Bank is not shown separately in official statistics. 135/ These statistics indicate that NIS 2.28 million was invested in water and electricity utilities by the municipalities in the West Bank in 1987/88, as shown in table 7. For the Gaza Strip, investment in water utilities was NIS 1.24 million in 1987/88. These figures indicate low investment levels, implying low and poor levels of water services in the Strip.

The low levels of investment in water utility projects are wholly insufficient for the development of water supply for the population of the occupied Palestinian territory, as compared to the respective levels in neighbouring countries. On average, investment in water utilities in the occupied territory did not exceed US$ 1.0 per capita, as compared to NIS 22.9 (US$ 13.7) in Israel. 136/ In Jordan, average investment in water utilities was about JD 5.00 (US$ 12.0) per capita. 137/

Owing to the limited scope of the study and shortage of data, a financial analysis is performed as an example. The case of the Water Department at Nablus Municipality is studied for the fiscal year 1988/89. 138/ Table 8 presents this analysis. According to the table, the return on investment equals (loss/capital formation) x 100 per cent = -21.4 per cent. The efficiency (E) equals R - VC + D = NIS -0.24 million. The break-even point (BEP) equals FC/(UP-UVC)

where: UP is the unit price
UVC is the unit variable cost

therefore,

BEP = $2.45 \times 10^6/(1.125-(3.93/2.216)) = -3.778$ mcm
(10^6 refers to million units)

An analysis of these results shows that variable costs form 61.6 per cent of total production cost. Net loss reached NIS 3.89 million, or a negative return on investment of 21.4 per cent. This is a clear illustration of the inadequacy of water utilities in the occupied territory.

The utility is found to be inefficient. Efficiency has a negative value of NIS 0.24 million. This indicates that the Nablus water utility does not contribute to national profitability. This is mainly because of the high share of variable costs in total production costs (especially the relatively high cost of electricity and fuel). In addition, it indicates inadequate management policies, especially with regard to pricing, as the unit variable cost exceeds the unit sale price, with the utility operating at a loss. Losses due to leakage through the old deteriorated water distribution network, currently estimated at 57 per cent in Nablus, also contribute to rendering the utility inefficient.

The break-even point is negative, which indicates that under the existing pricing policies, there is no economically feasible production level. However, if the unit price were set to exceed the unit variable cost, a break-even point could be found. The utility could be made economically feasible by raising the unit price and/or reducing water losses. Further analysis of this case with respect to its contribution to the economy and cost and pricing is presented in subsequent sections.

This example indicates clearly that water utilities in the occupied Palestinian territory are provided for their social benefits and not on grounds of economic feasibility.

Electricity

Capital outlays in electricity projects for the municipalities in the West Bank are not shown separately in table 7. The figure of NIS 2.28 million for the fiscal year 1987/1988 is conflated with that of water. More than half of this amount was invested in Hebron. Although all the electricity there is purchased from the IEC, the municipality owns and administers the distribution network, which has received investment funds. No development expenditure has taken place in Nablus, Jericho or Bethlehem. Capital outlays by the JDEC was NIS 2.69 million in 1988, which cover investment in the electricity system in the area under concession, including Jerusalem, Ramallah, Bethlehem and Jericho sub-districts. These low figures reflect the low level of development of the electricity services in the West Bank. Virtually no funds were spent on the development of electricity generation projects, with 95 per cent of the total supply of electricity consisting of purchased electricity from the IEC.

The Gaza Strip has not fared better. Investment by the municipalities in electricity projects was NIS 1.57 million during 1987/88. This small amount, allocated to the cities of the Strip, was insufficient for necessary network expansion. The total supply of electricity was purchased from IEC.

The low levels of investment in electricity projects are not sufficient to develop services for the growing population of the occupied Palestinian territory; the insufficiency is obvious when a comparison is made with figures in neighbouring countries. On the average, per capita investment in electricity utilities in the occupied territory did not exceed NIS 4.0 (US$ 2.4), as compared to the much higher per capita level of NIS 92.5 (US$ 55.4) in Israel. 139/ Low investment and current expenditures on electricity utilities are reflected in the low level and poor quality of services.

A sample financial analysis offers insight into these inadequate capital outlays. It concerns the case of the JDEC which is studied for the fiscal year 1987-88 140/ (table 9). Based on the figures given in the table, the return on investment equals (loss/capital formation) x 100 per cent = -66.2 per cent. The efficiency (E) defined as R - VC + D = NIS 4.64 million. The break-even point (BEP) equals FC/(UP-UVC)

where: UP is the weighted average *unit price* for household, trade, industry, street lighting and water pumping, calculated with respect to the percentage of total electricity consumption:

UP = 0.096 x 52.6 per cent + 0.116 x 23.6 per cent + 0.098 x 11.6 per cent + 0.092 x 5.3 per cent + 0.096 x 6.9 per cent = NIS 0.101

and, UVC is the weighted average variable cost per unit for purchased and produced electricity,

UVC = 0.244 x 3.05 per cent + 0.094 x 96.95 per cent = NIS 0.080

Therefore,

BEP = $10.94 \times 10^6/(0.101-0.080) = 510.02 \times 10^6$ kilowatt hour

Examination of these results shows that the variable cost forms 80.7 per cent of the total unit cost of electricity. Net loss totalled NIS 6.61 million, with the return on investment reaching a negative value of 66.2 per cent. This is a clear indication of the inadequacy of the electricity utility in the occupied territory.

The utility is found to be efficient. Efficiency reached a value of NIS 4.64 million. It indicates that the Jerusalem electricity utility contributes to national profitability. However, a comparison with the total annual wages and salaries for the employees in the company, which was NIS 5.60 million for the same year, shows that there is a deficit to the contribution in national profitability of 5.60 - 4.64 = NIS 0.96 million. The contribution of wages in this context is represented by the ratio of efficiency/wages which equals 82.9 per cent.

This situation is mainly owing to the high share of variable costs in total production costs (especially, the relatively high cost of produced electricity), and inadequate management policies, especially with regard to pricing under regulations set by the Israeli authorities which force the company to sell electricity at the same price as the IEC.

The break-even point is 510.02 million kilowatt hours as compared to the total purchased and generated electric power during the same year of 328.40 million kilowatt hours. This indicates that, under the above pricing policies, where the unit price slightly exceeds the weighted average variable cost per unit (but much less than the unit cost of generated electricity), the company is operating at a loss. However, additional electric power of more than 181.58 million kilowatt hours (or 55.3 per cent) to the purchased and generated electricity would have allowed the company to operate at a profit.

This example indicates that electricity utilities in the occupied Palestinian territory are provided mainly on grounds of social feasibility, although they may be said to be economically feasible inasmuch as revenues exceed variable costs.

Sewerage and refuse

These are under the rubric environmental utilities in table 7. The services are a source of grave concern owing to the negative externalities and pollution which can result. As mentioned earlier, scant attention has been directed at these utilities, and little has been invested to provide adequate efficient utilities, in either the West Bank or Gaza Strip.

Investments in these utilities reached NIS 2.05 million (or US$ 1.23 million) in 1987/88. Hebron had the highest share of investments in these utilities with 38.6 per cent. No funds were invested in utilities in 1987/88 in Nablus, Ramallah, Jenin or Jericho. Again, the Gaza Strip fared no better in this regard, with only NIS 1.85 million (or US$ 1.11 million) invested during the period. Nothing was spent in either Khan Yunis or Deir El-Balah. Adverse environmental effects may be the result, ultimately posing severe health hazards.

The above figures indicate an average of NIS 2.73 per capita investment in these utilities (or US$ 1.63) in the occupied Palestinian territory. This is quite low when compared to investment per capita in Israel which reaches NIS 14.12 (US$ 8.46). 141/ In Jordan, average investment in waste-water utilities for the same year was JD 5.9 per capita (US$ 14.2). 142/

Slaughterhouses and public markets

Data on investment in these utilities are included under investment in public buildings, which also comprises capital investments in schools and other public buildings. Available data, therefore, do not offer a clear view of investment in slaughterhouses and public markets.

Total investment in public buildings in the West Bank was NIS 3.64 million (US$ 2.18 million) for the fiscal year 1987/88. Among the cities which benefited most from these investments were Nablus, Jenin, Tulkarm and Ramallah. In Gaza Strip, NIS 1.98 million (US$ 1.19 million) was invested in public buildings, with the highest share allocated to Gaza city (69 per cent of the total).

Public safety

Available data on expenditures under this item include fire-fighting, rescue, emergency and security services. No separate data are available on investment in public safety in the West Bank and Gaza Strip. Current expenditure on this item in the West Bank was NIS 1.55 million (US$ 0.93 million). Nablus spent 33.5 per cent of this sum, Bethlehem 21.1 per cent, while the rest was allocated to other cities and towns in the West Bank. No data are available on expenditures on public safety in the Gaza Strip.

Per capita expenditure on these utilities reached NIS 1.79 (US$ 1.08). This is quite low when compared to current per capita expenditure in Israel of NIS 13.40 (US$ 8.02). This is another indication of the inadequate condition of public safety in the occupied Palestinian territory.

C. Contribution to the economy

Investment in any sector of the economy contributes to the economy directly by the amount of investment and through the indirect effect this investment has on income growth through the multiplier effect. Investment in public utilities may have multiplier effects on the Palestinian economy, depending on consumption habits, import propensities, tax rates, and other factors. Moreover, the development of any sector of the economy depends on the development of public utilities, especially water, electricity, sewerage and refuse services.

Table 10 shows total current expenditures on various utilities in municipalities of the West Bank (excluding east Jerusalem) in 1987/88. The largest share of expenditures was incurred in Nablus (42 per cent) followed by Hebron (21 per cent), while Jericho's share was the smallest (1.4 per cent). In Gaza Strip, current expenditure on public utilities in the city of Gaza constituted 66 per cent of the total. Current expenditure on public utilities by municipalities in the West Bank reached NIS 40.85 million (US$ 24.46 million) for the year 1987/88. Electricity accounted for the highest share of this expenditure (60.7 per cent), reaching NIS 24.80 million. In the Gaza Strip, current expenditure for the same year reached NIS 20.07 million (US$ 12.02 million); here again, electricity accounted for the highest share of this expenditure (84.1 per cent), totalling NIS 24.80 million. Total current expenditure on public utilities in the Gaza Strip did not exceed one third of that of the West Bank, despite the fact that the population of the Gaza Strip constitutes about 58 per cent of that of the West Bank. This situation may be largely owing to the fact that some of these utilities are supported by external resources.

Current expenditure on water supply in the West Bank was NIS 8.66 million in 1987/88 as shown in table 8, or 8 per cent of total current expenditure. Nablus Municipality spent 44 per cent of this amount, while 19 per cent was invested in Hebron, 7 per cent in Jenin, and 7 per cent in Tulkarm. None was spent by the municipalities in Ramallah and Bethlehem, because water is provided there by other authorities (i.e., Ramallah and Bethlehem Water Authorities). Current expenditure on water in Gaza Strip was NIS 2.66 million for the same year.

Current expenditure for electricity in the West Bank reached NIS 24.80 million in 1987/88 and constituted the main item of expenditure. It formed 24 per cent of total current expenditure, or 60 per cent of total expenditure on public utilities. Nablus (at 47 per cent of the total in the West Bank) had the highest expenditure on electricity. This is because Nablus is the only city in the West Bank to depend substantially on locally produced power. No current expenditure on electricity was made in Ramallah, Bethlehem, or Jericho, because these cities receive electricity from the JDEC.

As for the Gaza Strip, current expenditure on electricity was NIS 16.87 million in 1987/88 and constituted the main item of expenditure. It accounted for 42 per cent of total current expenditure, or 84 per cent of total expenditure on public utilities. Current expenditure on electricity was allocated mainly to Gaza city (66 per cent of the total), Khan Yunis (17 per cent), Rafah (12 per cent), and Deir El-Balah (5 per cent). The figures presented in table 10 result in an average of NIS 4.55 (US$ 2.67) of current expenditure per capita on these utilities in the occupied Palestinian territory. This is very low compared to expenditure per capita in Israel of NIS 81.69 (US$ 48.92).

The contribution of public utilities to the economy of the occupied Palestinian territory can be measured in terms of value-added, employment and net exports. However, not all of these can be calculated for the utilities considered, owing to data limitations.

In the occupied Palestinian territory, capital outlays on public utilities have been low, as mentioned above. The share of public utilities in GDP is included in official statistics under an item representing public and community services. These services constituted a small portion of the gross domestic product in the West Bank until 1984. In 1987, the contribution of public utilities was valued at NIS 342.0 million (US$ 204.8 million) forming 16.9 per cent of the GDP of the occupied Palestinian territory. 143/ This is low in comparison with proportions elsewhere. In Israel, for example, community services, in addition to water, electricity and construction (the latter not being a utility, but conflated in statistics) contribute NIS 12,524.0 million (US$ 7,499.4 million), forming 30.1 per cent of GDP. 144/ By excluding construction from this category, the share would obviously decline.

As for the utilities provided by the West Bank and Gaza Strip municipalities, their contribution to GDP is mainly through wages and salaries. Total wages and salaries related to utilities reached NIS 10.49 million for the year 1987/88 in the West Bank, and NIS 4.78 million for the same year in the Gaza Strip.

Estimated net exports of the two major utilities, water and electricity, are found to be negative. For water, the total annual amount of water imported from Israel for domestic purposes was 0.60 mcm at an average rate of about NIS 1.3 per cubic metre, resulting in a total cost of imported water of NIS 0.78 million per year. However, as discussed earlier, water transferred from the West Bank and Gaza Strip to Israel has been estimated at 514-528 mcm/yr (or NIS 668.2 million) against which no payments were made to the territories.

Regarding electricity, the total annual amount of electricity imported from Israel was estimated at 720.00 million kilowatt hours with an average per unit cost of NIS 0.18, resulting in a total of NIS 129.6 million per year.

As for employment in public utilities, the expansion in these utilities has created many jobs in the municipalities of the West Bank and Gaza Strip. It is estimated that a total of 2,240 jobs were created (1,500 in the West Bank and 740 in Gaza Strip) amounting to 0.6 per cent of the total labour force. 145/ A breakdown of employment by utility is available for the Gaza Strip only. For the year 1987/88, employment by local authorities in the Gaza Strip was 147 jobs in water utilities, 123 in electricity utilities, 230 in environmental utilities, and 240 in other utilities.

D. Cost, finance and pricing policies

Public utilities are provided in the West Bank at prices which rarely cover costs. This was illustrated in the previous sections through the presentation of examples of financial analysis. Owing to the limited scope of the present study, and the lack of necessary data, it has not been possible to perform such an exercise for all utilities in the occupied Palestinian territory. The examples presented were for two important institutions providing two vital utilities: water and electricity. It was found that utilities were provided mainly on the basis of their social desirability, and not on grounds of financial feasibility. Costing, financing and pricing policies for these are discussed below.

In general, the total income of Palestinian municipal authorities derived from providing public utilities was lower than the amounts disbursed. This is mainly because of poor management, especially in relation to pricing policies, and to gross technical inefficiency which leads to very high losses. These factors have made it difficult for municipalities to cover current expenses, let alone develop these utilities.

The income from all public utilities in the West Bank in 1987/88, as shown in table 11, was NIS 39.52 million (US$ 23.67 million) as compared to total funds disbursed which reached NIS 40.85 million (US$ 24.46 million). This figure equals 96.7 per cent of funds disbursed, leaving a deficit of 3.3 per cent. This deficit prevents utilities from developing on the basis of revenues generated. The deficit is financed from other sources of municipal revenue. These sources include loans and grants from Israeli authorities, municipal property taxes, building licences and fees, as well as external sources. The fund disbursed represents current expenditures alone.

In the Gaza Strip, a total of NIS 25.2 million (US$ 15.1 million) was generated as revenue, compared to the NIS 20.07 million (US$ 12.2 million) disbursed in 1987/88. This indicates that while some utilities do generate surpluses, these are not sufficient to meet perceived requirements. The costing, financing and pricing policies for each of the utilities are presented below:

1. Water

The cost of water differs from area to area, depending on the source of water and the authority or department which administers water utilities.

Table 12 shows the cost as well as the price to consumers per cubic metre of water for the cities of the West Bank. The table illustrates clearly the considerable disparity between production costs and prices charged to consumers. As an example of cost estimation, the per unit cost of water is calculated and presented in this section for Nablus, according to the data supplied by the Department of Water in that municipality. 146/

The water authorities in Ramallah and Bethlehem sell water at a profit, since the unit price is higher than the average unit cost. However, available data for a number of municipalities which have water departments show that cost exceeds the per unit sale price, as in the cases of Nablus and Jericho; in Jenin, it is only slightly less than the price charged. In Nablus and Jericho, water utilities are subsidized from other municipal sources of revenues. No data are available on unit costs in Tulkarm and Hebron. For Ramallah Water Authority, the cost of a cubic metre produced from own resources is JD 0.237, while that purchased from Mekorot is almost double, at JD 0.445.

Based on the analysis of the cost elements of water produced by Nablus municipal water department, the total cost for the 2.216 million cubic metres sold was NIS 6.38 million, consisting of NIS 2.45 million fixed costs (38.4 per cent of the total) and NIS 3.93 million variable costs (61.6 per cent of the total). The cost breakdown reveals the high share of variable costs as compared to fixed costs. The cost of electricity and fuel alone represents about half the total cost of water production.

The unit cost of water sold is calculated on the total quantity of water actually sold according to water meters (2.216 mcm/yr). The total amount of water produced was 4.597 mcm/yr. Leakage and losses in the water distribution system, owing to the network's age and deterioration in many locations, as well as faulty meters, rendered metered water as only 48.2 per cent of the total produced.

Therefore the unit cost of water sold is as follows:

* The unit cost of water sold = the unit cost of water produced x (water produced/water sold)

= 1.388 x (4.597/2.216)

= NIS 2.879

The unit price of water was set at NIS 1.125. This price was not chosen on the basis of financial considerations. According to the municipality, it is important that the price of a major basic utility and necessity of life should not be high, especially for low income groups. This resulted in a loss of 2.879 - 1.125 = NIS 1.754 per cubic metre. Overall, the deficit was $1.754 \times 2.216 \times 10^6$ = NIS 3.89 million during the year 1988/89. This shows the seriousness of the financial deficit in the provision of water. The pricing policies are deficient as prices do not even cover the variable costs of production.

Production costs in Nablus were much higher than in other cities and towns in the West Bank, as illustrated in table 12. This is basically owing

to high consumption of electricity needed to pump water from the low-lying sources in Fara'a up to Nablus, at a considerably higher elevation, as well as the high rates of leakage and loss.

The break-even point, as calculated in section B.1 above, is negative, indicating that under the above pricing policies, where the unit price is less than the variable cost per unit, it is not possible to be profitable. The lowest price that could be charged to consumers so that the utility would break-even can be calculated as:

* unit price = (total fixed cost/quantity) + variable cost per unit

= $(2.45 \times 10^6/4.597 \times 10^6) + (3.93 \times 10^6/4.597 \times 10^6)$

= NIS 1.388

The above calculation is based on output of 4.597 million cubic metres. However, the quantity of water actually sold according to water meters was only 2.216 million cubic metres, owing to leakage and losses. Therefore, the real unit price of water should be as follows:

* The unit price of water sold = the unit price of water produced x (water produced/water sold)

= 1.388 x (4.597/2.216)

= NIS 2.879

This would represent 255.9 per cent of the price actually charged.

In rural areas, where Mekorot or the West Bank Water Department supplies villages with water, current prices for local authorities are NIS 1.20 (JD 0.35), per cubic metre. Usually these authorities charge the consumer an extra 5-25 per cent for services. Mekorot charges Palestinian local authorities much higher prices than it charges Israeli settlement authorities. For example, in 1986, Mekorot was charging Palestinian local authorities NIS 0.70 per cubic metre, for household and agricultural use, while charging Israeli settlement authorities in the West Bank NIS 0.15 to 0.23 per cubic metre. 147/ Mekorot prices are less than those for water produced locally owing to economies of scale and the subsidies received from the Israeli Government.

In general, one of the major reasons for high costs of water is the very high rate of losses and leakage, which exceeds 50 per cent in a number of cities in the West Bank, and 30 per cent in the Gaza Strip. The example of Nablus presented above illustrates the effect of this on unit cost.

2. Electricity

The cost of electricity also differs from one area to another according to whether it is locally produced or purchased from Israel. Table 13 shows the cost as well as the price per kilowatt hour for each of the cities of the West Bank. The JDEC has concession rights over the Jerusalem district, and serves Jerusalem, Ramallah, Bethlehem and Jericho. Currently, the company's

price per unit for these cities is JD 0.060 (NIS 0.217) for household use, and JD 0.063 (NIS 0.220) for industrial use, as compared to the cost per unit purchased of JD 0.057 (NIS 0.200). The Israeli authorities oblige the company to sell electricity at specified prices, which are considered to be low, in order to match those of the IEC inside the Green Line. This is because the authorities do not allow charges on Israeli settlements supplied by the company to be higher than those for other Israelis supplied by the IEC.

An analysis of cost elements for the JDEC, as based on available data for the fiscal year 1988 148/ presented in table 9, indicates that:

* The total cost of electricity (produced and purchased) was NIS 43.16 million, consisting of NIS 10.94 million fixed costs (19.3 per cent of the total), and NIS 32.22 million (80.7 per cent of the total) variable costs. The breakdown for these costs is as follows:

  * The variable cost per unit of electricity purchased is calculated as follows:

    * unit cost = (purchase cost + transmission and distribution costs x (quantity purchased/total produced and purchased electricity))/quantity purchased

      = $(26.77 \times 10^6 + (3.11 \times 10^6 \times (318.40/328.40)))/318.40 \times 10^6$ = NIS 0.094

  * The fixed cost per unit of both purchased and produced electricity is calculated as follows:

    = total fixed cost/total quantity of produced and purchased electricity

    = $10.94 \times 10^6/328.40 \times 10^6$ = NIS 0.033

  * The total cost per unit of produced electricity is:

    = 0.244 + 0.033 = NIS 0.277

  * The total cost per unit of purchased electricity is:

    = 0.094 + 0.033 = NIS 0.127

The cost breakdown shows that the variable cost per unit of electricity produced (NIS 0.244) is much higher than that (NIS 0.094) per unit purchased. The variable cost per unit produced is 260 per cent of that per unit purchased.

The share of variable cost in total cost per unit is relatively high in the case of produced electricity. This share reaches 0.244/0.277 x 100 per cent = 88.1 per cent. Regarding purchased electricity, the share

reaches 0.094/0.127 x 100 per cent = 74.0 per cent. In the case of produced electricity, the cost of fuels represents 39.4 per cent of the production cost.

The weighted price per unit (UP) of electricity sold is calculated using shares in consumption and tariffs assigned for specific uses as weights. The weighted average unit price for household, trade, industry, street lighting and water pumping uses calculated with respect to shares in total electricity consumption is:

UP = 0.096 x 52.6 per cent + 0.116 x 23.6 per cent + 0.098 x 11.6 per cent + 0.092 x 5.3 per cent + 0.096 x 6.9 per cent
= NIS 0.101

A comparison between the unit price and the unit cost is illustrated for both generated and purchased electricity. For generated electricity, this results in a deficit of 0.244 - 0.101 = NIS 0.143 per kilowatt hour if variable costs are considered alone. When total cost is considered, the deficit is 0.277 - 0.101 = NIS 0.176 per kilowatt hour. For purchased electricity, there is a profit of 0.101 - 0.094 = NIS 0.007 per kilowatt hour, if variable costs are considered alone, but when total cost is considered, a deficit of 0.127 - 0.101 = NIS 0.026 per kilowatt hour results.

These figures illustrate the seriousness of the financial deficit in the provision of electricity. The pricing policies are deficient, as prices do not even cover variable costs of production. The management of the company bears partial responsibility for these policies, but it has to be restated that the Israeli authorities force the company to sell electricity at prices similar to those charged by the IEC inside the Green Line.

The break-even point is 510.02 million kilowatt hours, as calculated earlier. Current output levels would demand a unit price (in order to break-even) of:

* unit price = total fixed cost/quantity + (weighted variable cost per unit)
= $(10.94 \times 10^6 / 328.40 \times 10^6 + (0.244 \times 3.05$ per cent + 0.094 x 96.95 per cent)
= NIS 0.132

This is compared to the current unit price of NIS 0.101, indicating the need to increase the unit price by 0.132 - 0.101 = NIS 0.031 or a 31 per cent increase over the current price.

In other cities, where electricity is purchased by municipalities from the IEC, the municipalities make a marginal profit by selling electricity at prices that are generally higher than costs. No Palestinian municipality supplies the Israeli settlers with electric power, and the Israeli authorities do not force municipalities to sell electricity at prices similar to those of the IEC, as in the case of the JDEC.

In Nablus, where some electricity is locally produced, the unit production cost is currently JD 0.105 while that purchased from the IEC costs JD 0.060 per unit. The price per unit sold is JD 0.110 and JD 0.100 for

household and industrial uses, respectively. The cost of power produced locally is almost double that purchased from the IEC, owing to the economies of scale in the case of the Israeli corporation and the subsidies received. The unit price charged for the locally generated electricity does not cover the variable cost of production.

In Gaza, the electricity utility is run at a profit. The cost per purchased kilowatt hour is currently JD 0.047, while the price of the unit sold is JD 0.067 for household use and JD 0.075 for industrial purposes.

In rural areas, villages outside the Jerusalem District either produce electric power from local generators or purchase electricity from a neighbouring city or from the IEC. No data are available on prices and costs in rural areas.

Like the pricing policies for water, no established procedure is used by the municipalities to set the unit price level. In general, prices are set to cover variable costs but not necessarily fixed costs. The JDEC case differs in that prices are set according to Israeli regulations.

3,4. Sewerage and refuse

Generally, there is no charge for wastewater collection services. However, there is a fee for connection of houses and buildings with the sewer network in most cases. The fee depends on the cost of connection which in turn depends on the location of the house or building with respect to the existing sewer system. In the case of new sewers, the construction cost is usually borne by the recipients of the service.

Regarding refuse utilities, a small monthly fee is collected from shops and offices, and from residents within the limits of the municipalities. The fee is set by the municipality without any cost calculation or pricing procedures. The major cost items are wages and operation of the solid waste transporters. Fees do not cover the running expenses of this utility.

There are no detailed data available on the costs of sewerage or refuse services, essential for determining economically feasible charges. Regarding fees, the example of Nablus is a case in point. The fee charged for connecting a dwelling unit to the sewer mains is set at JD 25.0 in Nablus, while that for the connection of a shop or store is set at JD 5.0. The fee for refuse collection ranges from JD 6.0 to 12.0 per dwelling unit and JD 16.0 to 24.0 per shop or store.

A rough comparison between income and current expenditures regarding utilities, as presented above, indicates that for the year 1987/88, the total income of the local authorities from these utilities was NIS 2.09 million as compared to total current expenditure of NIS 5.84 million. In the Gaza Strip, sewerage services generated an income of NIS 0.32 million as compared with NIS 0.54 million current expenditure. Pricing policies could be adjusted so that generated income covered at least current expenditure, and to avoid high levels of cross-subsidization out of other municipal tax revenue. However, given the nature of these utilities, such subsidization may continue to be considered socially desirable.

5,6. Slaughterhouses and public markets

There is either a specified fee per slaughtered animal or a fee calculated as a percentage of its total value. In some cases, fees do not cover salaries and operating costs of the slaughterhouses run by municipalities.

Public markets collect a fee representing a specified percentage of the value of items sold and charged on each wholesale operation. Usually, the market is leased for a fixed annual sum to a company which is responsible for the collection of fees.

There are no detailed data available on the cost of slaughtering or public market services, so that economically feasible charges could be determined. The fee charged per slaughtered head at Nablus slaughterhouse, for example, was set at an arbitrary level of JD 1.5. The service fee in public markets represents 3 to 4 per cent of the sale value for any wholesale exchange. Again, no procedure is followed to calculate a charge that would cover the cost of the service or the space provided.

7. Public safety

There are no fees charged for the public safety utilities. These utilities are financed by municipal sources and are provided on the basis of their social desirability, not on economic feasibility. Total current expenditure on this subsector was NIS 1.55 million for the local authorities in the West Bank in 1987/88. The per capita cost of public safety services is NIS 1.73, which is financed from various income sources such as loans and grants from Israeli authorities, municipal taxes and others.

E. Manpower and technology factors

In this section, an analysis of manpower and technological factors utilized in providing the various public utilities is presented.

1. Water

The manpower employed in municipal water departments or water authorities in the West Bank and Gaza Strip consists of technical and administrative personnel.

The technical personnel include engineers, technicians and unskilled employees. The engineers, both civil and mechanical, are well-trained and experienced; they design facilities, administer maintenance activities and operate pumping stations. Other employees in the technical section range from a limited number of educated technicians holding two-year degrees from junior colleges to a majority of unskilled workers who perform the installation or maintenance of water distribution systems.

Employees in the administrative section range from clerks to meter readers and accountants. A limited number of these hold college or university degrees. Recently, owing to computerization of several water departments and authorities, trained computer personnel have been employed.

Managers of water departments are appointed by the municipal council, while those in Palestinian water authorities in the subdistricts are elected officials of the municipalities and villages in the area covered. In many cases, managers of water departments lack good administrative background and experience. They are generally civil or mechanical engineers who have no special training in administering municipal systems.

In general, there is a lack of training programmes for engineers and technicians. Young and inexperienced technicians require training programmes as well. There are virtually no experienced personnel trained in the treatment of water. No local institution offers related programmes and no training abroad is provided.

There are no detailed data on the different categories of salaries and wages for the employees in water utility departments. However, the example of Nablus shows that for the year 1988/1989, total salaries were NIS 1.24 million, and total wages NIS 0.50 million.

Water distribution system extensions are performed without consideration of optimal design. In many cases, these are undertaken without any real design process, and extensions of the old parts of the water networks are made utilizing the inefficient branching systems.

Because the water distribution systems in many cities are very old with considerable leakage, and installed on the basis of inefficient branching systems, and because of shortages in water tank capacities, water is being continuously and directly pumped from pumping stations to the water distribution pipes. This is accomplished at very high pressures of 300-400 pounds per square inch (psi) in some cases, where it should not exceed 100 psi.

Owing to high demand relative to limited supply, water is not pumped continuously to all areas simultaneously. When pumping is stopped, the returning water in the pipes provokes a water hammer phenomenon which results in considerable wear and tear on the water distribution system.

Commonly, diesel pumps with high horsepower are utilized in pumping water and are operated for 22 or 24 hours a day. This method increases the per unit water cost. Only recently have electric pumps been introduced in a number of places. More elevated water tanks are required so that continuous pumping can be minimized. However, such projects require considerable capital investment.

There is no company or department in the West Bank or Gaza Strip that drills boreholes. Since occupation in 1967, the Israeli authorities have controlled the exploration and drilling process and prohibited Palestinians from performing this task. Only Israeli companies are authorized to drill boreholes for local or regional Palestinian authorities after they obtain the required permit from the Israeli authorities. There is a need to establish entities with the appropriate equipment for drilling new boreholes with greater depths and more stable yields.

There are no well-equipped research and experimentation stations or laboratories as necessary for testing water quality on a daily basis at each municipal department or authority.

2. Electricity

The manpower employed in municipal electricity departments in the West Bank and Gaza Strip, as well as the JDEC, consists of both technical and administrative personnel.

Technical sections in the various municipal departments employ one engineer or more, a limited number of technicians, and unskilled labourers. Manpower in these sections is devoted to the operation and maintenance of electric grid lines and the erection and maintenance of transformer stations. In Nablus, where the only large power station in the occupied Palestinian territory is still in operation, a substantial number of electrical and mechanical engineers, as well as a number of technicians are employed. In the JDEC, there are seven engineers and 157 other technicians and unskilled workers. 149/

In the administrative sections, employees work as clerks, accountants and meter readers. Only a limited number of employees have university or college qualifications. Computer experts have been added to these sections since the introduction of computing facilities.

There are no detailed data on the different categories of salaries and wages for the employees in electricity departments. However, for the previously presented example of the JDEC, in 1988, total wages and salaries for production of electricity was NIS 1.13 million, for transmission and distribution NIS 2.08 million, and for administration NIS 2.39 million.

The management of the municipal electricity departments is performed by a head of department appointed by the municipal council. However, in JDEC, a board of directors administers the company in cooperation with a general manager, usually appointed by the board.

Training programmes for staff (especially engineers and technicians) in the municipal electricity departments, as well as the JDEC, are limited, and only a small number of employees benefit from these programmes each year. Training programmes should be expanded and developed in order to create more experienced engineers and technicians.

3. Sewerage

Manpower assigned specifically for work in sewerage utilities is limited. There are no departments in the municipalities specialized in wastewater collection and management. Utilities in this field are administered through municipal water, public works and health or engineering departments which provide the necessary manpower for the subsector when required.

One engineer (or more) specialized in environmental engineering is employed in a number of the municipalities of the large cities. Their major duties include the design of sewer collection systems. A number of unskilled labourers are employed in the construction of these systems.

Wastewater flows freely, in most cases, through the sewer mains to neighbouring valleys. There are no comprehensive treatment plants to purify

wastewater for re-use in irrigation. Pumps are used to pump wastewater from collecting substations in cities and towns with flat topography, such as Ramallah or Gaza.

The West Bank and Gaza Strip lack specialized environmental research stations and laboratories to facilitate the periodical testing of wastewater and monitoring of pollution levels. This is mainly owing to the lack of financial resources required for this purpose.

4. Refuse

Solid waste collection is carried out manually, with refuse collected from houses, stored in neighbouring containers, and then transported by vehicle to landfills. Manpower in this process is extensive and is composed mainly of unskilled labour lacking proper education and training. For example, workers handle solid waste without wearing special clothing for protection and lack knowledge of health standards.

The total number of workers in refuse collection was 257 in most of the urban areas of the West Bank (excluding east Jerusalem, Jenin and Hebron), as presented in table 5. There is no adequate management of solid waste collection and disposal activities, reflecting the lack of seriousness of the municipalities in dealing with the utility.

As indicated earlier, there are no sorting and classification centres for possible re-use and recycling of specific materials. Similarly, there are no treatment plants for solid waste in the occupied Palestinian territory, where the only treatment is by open-air incineration. The West Bank and Gaza Strip lack central regional refuse disposal plants which could help in producing electric energy. The absence of these facilities is mainly owing to the lack of financial resources.

5. Slaughterhouses

Operations in slaughterhouses in the West Bank and the Gaza Strip are executed manually. Manpower in slaughterhouses is typically composed of a veterinarian, a meat inspector and an accountant, in addition to a number of unskilled health workers. The slaughtering operation itself is performed inside the slaughterhouses by butchers. In Nablus slaughterhouse, there is one veterinarian, two meat inspectors, two accountants and three to five health workers. There are 50 butchers who slaughter their own animals inside the slaughterhouse.

As noted earlier, air compressors are used in some instances to facilitate the slaughtering process. In a few instances, work is in progress to mechanize the process. Slaughterhouses lack refrigeration facilities. Moreover, there are no treatment facilities for the resulting liquid and solid wastes. In general, the slaughterhouses in the West Bank and Gaza Strip lack specialized laboratories that are required for testing procedures on meat. All of these deficiencies are attributable to limited funds allocated to this subsector.

6. Public markets

Public wholesale markets are administered by representatives from municipalities. Manpower employed by the municipalities in the public markets includes accountants and health workers. No data are available on specific employment in the subsector.

The cargo handling processes are carried out manually in most cases, although fork lifts are used. In one of the newly expanded public markets, in Nablus, refrigerated stores are being constructed to allow storage of vegetables and fruits.

7. Public safety

Manpower in municipal public safety departments consists mainly of fire-fighters with secondary school education who possess special skills and training. These employees have little training in rescue and first aid operations. The equipment used is generally old, especially that for rescue operations. Most of the fire-fighting vehicles are old and not very well equipped, with the exception of relatively new fire-fighting vehicles in a number of urban centers in the West Bank and Gaza Strip. In general, there is a lack of emergency vehicles and special rescue equipment. No development funds are provided in order to upgrade the equipment.

More training programmes are required for improving the skills of the employees in the public safety departments of the municipalities in the occupied Palestinian territory in order to upgrade the quality of services provided.

Chapter IV

CONCLUSIONS AND RECOMMENDATIONS

The conditions of the public utilities in the occupied Palestinian territory have been assessed and evaluated in the previous chapter in terms of their adequacy and efficiency. The dimensions considered included: supply and demand; investment and capital formation; contribution to the economy; costing, financing and pricing policies; and manpower and technology factors. It is appropriate to cover here possible short-term measures and actions that could be introduced in order to remedy the situation and try to solve some of the problems elucidated in the foregoing analysis.

Among the major problems facing each of the utilities surveyed and the suggested counteracting short-term measures for action to be taken are the following:

Water

Problem		Measures and Actions
1.	Lack of planning	- Establishing a new national water department with various sections including planning, coordination, technical, etc., to be responsible for the overall administration and planning of water utilities, on the basis of the existing West Bank Water Department.
		- Developing a master water-resources plan including the location of water springs, water wells, possible groundwater resources, etc.
		- Enhance planning at the local authority and municipal level through proper training and engagement of specialists.
2.	Shortages of water supply	- Promotion of an intensified water exploration, conservation and search programme by the proposed national water department.
		- Development of available groundwater supply sources to satisfy the needs of Palestinians currently supplied by the Israeli-controlled departments and Mekorot.
3.	Limited water utility service	- Expansion of water utilities to cover all urban areas (i.e. the rest of urban population not served).

		- Establishing water utility services in unserved rural areas (i.e. for the remaining 176 or so villages not currently supplied with water).
4.	High losses and deterioration of water distribution systems	- Rehabilitation and replacement of old pipes, using locally produced pipes, so as to reduce leakage.
		- Building water tanks utilizing existing local construction methods and materials.
		- Repairing or replacing faulty meters.
5.	Deterioration of water quality and lack of labs	- Establishment of experimentation stations and laboratories for testing the quality of water.
		- Application of water treatment measures.
		- Provision of water treatment facilities.
6.	Lack of proper pricing policies	- Setting prices to at least cover variable costs and/or subsidize the utility services.
		- Enhancing management capabilities of water departments through proper training, and appointing qualified managers.
7.	Lack of funding	- Soliciting international aid and allocating special development budgets from relevant United Nations agencies and from donor countries.
8.	Lack of training	- Establishing a central training school with special training programmes for employees.
		- Establishing college programmes and courses in water supply and management in one of the existing colleges, for example, Hebron Polytechnique.
9.	Management	- Enhancing the management process by offering incentives to attract experienced managers.
		- Offering special courses and training programmes for managers of water departments in the proposed training school.
10.	Lack of efficiency and cost-effectiveness	- The municipalities should consider the leasing of the utility to private enterprises under well-established conditions.

- Eventually this utility could be privatized to serve the general public.

Electricity

Problem	Measures and Actions
1. Lack of planning	- Establishing a new national electricity and energy department with sections for planning and coordination, as there is no existing body in either the West Bank or Gaza Strip.
	- Developing a master electricity plan, indicating possible production centres and methods and/or purchase alternatives, in addition to demand analysis.
	- Enhance planning at the municipal level through proper training and attraction of specialists.
2. Shortages in electricity supply	- Promotion of an intensified electricity programme, especially in stations where production ceased because of lack of maintenance and spare parts.
	- Study of alternative energy supply sources for satisfying the needs of the Palestinians currently supplied by the IEC, in order to have independent sources.
3. Limited electric utility service	- Extension of electricity utilities to cover all urban areas (i.e. for the rest of population inside urban areas not served currently by electricity).
	- Establishing regular electric utility services to unserved rural areas (i.e. for about 60 per cent of total rural population).
4. Overloaded electric distribution systems	- Replacement of overloaded lines.
	- Erection of transformer substations with the proper specifications.
5. Lack of proper pricing policies	- Setting prices on an economic basis. Prices should at least cover variable costs or enjoy subsidies based on certain objectives and criteria.

		- Enhancing management capabilities of electricity departments through proper training and appointment of qualified managers.
6.	Lack of funding	- Soliciting international aid and allocating special development budgets from relevant United Nations agencies (UNDP) and donor countries.
7.	Lack of training	- Establishing a central training programme for employees.
		- Establishing college programmes and courses in electric power supply and management in an existing academic institution, for example Hebron Polytechnique.
8.	Management	- Enhancing the management process by offering incentives to attract experienced managers accompanied by a well-conceived programme for career development.
		- Offering special courses and training programmes for managers of electricity departments.
9.	Efficiency and economy	- Examination of possibilities to privatize electricity generation and sale under a well-designed privatization programme.

Sewerage, Refuse

Problem		**Measures and Actions**
1.	Lack of planning	- Establishing a new national environmental department with various sections including planning, coordination, etc., to be responsible for the overall administration and planning of environmental utilities.
		- Developing a master environmental plan including wastewater management plan and refuse disposal plan.
		- Enhancing planning at the municipal level through proper training, and through the engagement of specialists.
2.	Limited sewerage utility services	- Expansion of wastewater collection utilities to cover all urban areas.
		- Establishing wastewater collection services in the large rural areas.

		- Supporting the construction of septic tanks in the remaining rural areas.
		- Construction of wastewater treatment plants.
3.	Limited solid waste utility services	- Expansion of solid waste collection utilities to cover all urban areas.
		- Establishing solid waste utility services in the rural areas.
4.	Lack of solid waste facilities	- Promotion of solid waste classification and re-use programmes and facilities, especially in locations of regional area of influence.
		- Adding new areas to existing landfills and transferring landfill sites to more remote areas if they are too close to housing and other developments.
		- Construction of regional solid waste treatment plants.
5.	No control for solid waste disposal	- Control of open air incineration as a solid waste treatment practice, and checking the emission rates.
6.	Lack of proper pricing policies	- Setting fees to at least cover variable costs and/or subsidize the utilities, especially for refuse services.
		- Enhancing management capabilities of departments administering the services.
7.	Lack of funding	- Soliciting international aid and allocating special development budgets from appropriate sources including United Nations agencies and donor countries.
8.	Lack of training	- Establishing a central training school offering training programmes for employees.
		- Establishing college programmes and courses in wastewater management, in one of the existing universities, e.g. An-Najah University.
9.	The inexistence of proper labs	- Establishing experimentation stations and laboratories with research capacities for wastewater testing and monitoring.
10.	Management	- Enhancing the management process by offering incentives to attract experienced managers.

		- Offering special courses and training programmes for managers of departments dealing with wastewater in the proposed training school.
11.	Efficiency consideration	- Investigate the merit of leasing such services to the private sector under strict conditions.

Slaughterhouses

	Problem	Measures and Actions
1.	Limited slaughtering utility services	- Expansion of slaughtering utilities to cover all urban and rural areas.
		- Introducing bird and chicken slaughtering.
2.	Lack of and inadequate slaughtering facilities	- Construction of slaughtering facilities in large rural centres.
		- Modernize existing slaughterhouses by introducing mechanical slaughtering and storage refrigerators.
		- Providing refrigerated transport vehicles.
		- Construction of liquid waste and blood treatment facilities.
3.	No control of slaughtering	- Control of slaughtering by the introduction of legislative rules to forbid slaughtering outside slaughterhouses.
4.	Lack of meat inspection	- Establishing specialized laboratories to facilitate the necessary testing procedures on meat.
5.	Lack of proper pricing policies	- Setting fees to at least cover costs
		- Enhancing management capabilities of slaughterhouses.
6.	Lack of funding	- Soliciting international aid, and allocating special development budgets from relevant sources including United Nations agencies and donor countries.
7.	Management	- Enhancing the management process by offering incentives to attract experienced managers.
		- Offering special courses and training programmes for managers.

8.	Efficiency and economy	- Investigating the leasing out of these services to the private sector under appropriate control measures.

Public Markets

Problem		Measures and Actions
1.	Limited public market services	- Expansion of existing public wholesale markets where necessary.
		- Establishing small-scale markets in the smaller towns.
2.	Lack of and inadequate public market facilities	- Modernizing existing public market facilities introducing mechanical loading/unloading.
		- Addition of refrigerated storage facilities.
3.	Lack of proper pricing policies	- Setting prices to at least cover variable costs.
		- Enhancing technical capabilities.
4.	Lack of funding	- Soliciting international aid and allocating special development budgets from relevant sources including United Nations agencies and donor countries.
5.	Management	- Enhancing the management process by offering incentives to attract experienced managers.

Public Safety

Problem		Measures and Actions
1.	Limited public safety utility services	- Expansion of existing public safety departments.
		- Establishing local public safety departments in small towns and big villages.
2.	Lack of and inadequate public safety facilities	- Construction of public safety facilities in large rural centres.
		- Adding more new fire-fighting vehicles and replacing old and incapable vehicles.
		- Providing sufficient emergency vehicles.
		- Providing necessary special rescue equipment for all public safety centres.

3.	Lack of funding	-	Soliciting international aid and allocating special development budgets from relevant sources, including United Nations agencies and donor countries.
4.	Insufficient training	-	Establishing advanced training programmes for public safety employees.
5.	Management	-	Enhancing the management process by offering incentives to attract experienced managers.
		-	Offering special courses and training programmes for managers.

Notes

1/ M. Haddad and S. Abu-Eisheh, "Water Consumption in the West Bank", Proceedings of the workshop on water in the occupied Palestinian territory, An-Najah National University, forthcoming, 1991 (in Arabic).

2/ The figure is calculated from data presented in N. El-Khatib, "Water in the West Bank: Past, Present and Future", Proceedings of the conference on water in the West Bank, The Engineers Association, Jerusalem, 1990 (in Arabic), p. 20.

3/ M. Haddad and S. Abu-Eisheh, "Water Consumption ...", op. cit.

4/ M. Haddad, The environment in the occupied Palestinian territory, A preliminary report prepared for the Conference on the Management of the Environment in the Mediterranean, Nicosia, The Centre for Engineering and Planning, April 1990.

5/ M. Haddad, The Environment ..., op. cit.

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8/ M.Z. Aslan, Nablus Municipal Water Project, Nablus Municipality, Nablus, 1970.

9/ Data gathered through personal communications with the engineer of Jenin Municipality, April 1991.

10/ Data gathered through personal communications with the engineer of Tulkarm Municipality, March 1991.

11/ Data gathered through personal communications with the engineer of Hebron Municipality, May 1991.

12/ M. Haddad, The environment ..., op. cit.

13/ These percentages are calculated from data presented in the Hashemite Kingdom of Jordan, 1952 Census of Housing, Amman, 1953 (in Arabic) - see, for example, table 10, pp. 25-26.

14/ M. Shuman, Electric power in the West Bank and the Gaza Strip, Arab Thought Forum, Jerusalem, 1981, p. 4.

15/ Data gathered through personal communications with the engineers of the Jerusalem District Electricity Company, April 1991.

16/ The Hashemite Kingdom of Jordan, 1952 Census of Housing, op. cit.

17/ T. Nassar, "Nablus Electric Generation Station", Al-Muhandes, Engineers Association, pp. 15-20, Jerusalem, Feb. 1986 (in Arabic).

18/ The presentation on the development of the electric generation station of Nablus as appears in Nablus Municipality, The opening of the new electric generation station, Nablus, 1981 (in Arabic), pp. 2-5.

19/ Ibid. p. 9.

20/ Data are gathered from personal communications with the engineers of the Department of Electricity at Nablus Municipality, April 1991.

21/ M. Shuman, Electric power...., op. cit., p. 8.

22/ Data gathered through personal communications with the Engineer of the Tulkarm Municipality, April 1991.

23/ The Hashemite Kingdom of Jordan, 1952 Census of Housing, op. cit.

24/ M. Shuman, Electric power ..., op. cit., p. 6.

25/ Ibid. pp. 9-11.

26/ Data gathered through personal communications with the engineer of Nablus Municipality, April 1991.

27/ Ibid.

28/ Ibid.

29/ Different sources give different estimates of the current Palestinian population in the West Bank and Gaza Strip. The percentage here is based on population numbers of the Israel Central Bureau of Statistics, Statistical abstract of Israel, No. 41, Jerusalem, 1990, table 27.1, p. 708. Data on the population of Palestinians in Jerusalem are extracted from the Israeli Central Bureau of Statistics, Statistical Yearbook of Jerusalem, No. 6, Jerusalem, 1987. Different estimates for the Palestinian population are found in S. Abu-Eisheh, et. al., Future transportation infrastructure needs for the Palestinian people in the West Bank and the Gaza Strip, report submitted to the Centre for Engineering and Planning, 1989, and in M. Benvenisti, and S. Khayat, The West Bank and Gaza Atlas, The West Bank Database Project, Jerusalem, 1988.

30/ No single estimate exists for these quantities, see O. Rimawi, and I. Salameh, "Water resources in Palestine - The West Bank and Gaza Strip", in The proceedings of the conference on water resources in the Arab countries and their strategic significance, The University of Jordan, Amman, 1990 (in Arabic) p. 202. See also A. El-Dwaik, "A new dimension of water dilemma in the West Bank and Gaza Strip", Proceedings of the conference on water in the West Bank, The Engineers Association, Jerusalem, 1990 (in Arabic) pp. 65-101, and N. El-Khatib, "Water in the West Bank: past, present and future", Proceedings of the conference on water in the West Bank, the Engineers Association, Jerusalem, 1990 (in Arabic) pp. 15-26.

31/ M. Haddad, and S. Abu-Eisheh, "Water consumption in the West Bank", Proceedings of the workshop on water in the occupied Palestinian territory, An-Najah National University, (forthcoming, in Arabic).

32/ Ibid.

33/ Ibid.

34/ Ibid.

35/ These estimates are based on UNRWA, Palestine refugees in the West Bank, Gaza Strip, Syria, Jordan and Lebanon, January 1980. In addition, water consumption data were gathered from the UNRWA regional office in Nablus, May 1991.

36/ This average per capita consumption is calculated from the data on total water consumption in Israel given in Israel Central Bureau of Statistics, Statistical abstract of Israel op. cit., p. 449. Other estimates are found in A. Labady, "Zionist ideology and Israel's water strategy", paper presented at the Seminar on rural development in the occupied Palestinian territory, Amman, 1989 (in Arabic) p. 40.

37/ Data gathered through personal communications with the engineers of the Ramallah Water Authority, April 1991.

38/ Ibid.

39/ These percentages are taken from Jerusalem Undertaking-Ramallah District, Progress report, 1991, p. 35.

40/ N. Abu-Elhalawah, "Ramallah Water Authority: present and future", Proceedings of conference on water in the West Bank, the Engineers Association, Jerusalem, 1990 (in Arabic), pp. 49-55.

41/ Data gathered through personal communications with the administration of the Ramallah Water Authority, June 1991.

42/ Information supplied by the engineers of the Bethlehem Water Authority, April 1991.

43/ Ibid.

44/ Data gathered through personal communications with the engineer of Jericho Municipality, April 1991.

45/ According to engineers of the Department of Water at Nablus Municipality, March 1991.

46/ Department of Water, 1988/1989 Annual Report, Nablus Municipality, 1989.

47/ Ibid.

48/ This percentage is reported by the engineer at the Department of Water, Nablus Municipality, during a visit to the Department in March 1991.

49/ Data gathered through personal communications with the engineer of Tulkarm Municipality, April 1991.

50/ Ibid.

51/ Data gathered through personal communications with the engineer of Hebron Municipality, April 1991.

52/ Data gathered through personal communications with the engineers at Gaza Municipality, April 1991.

53/ Data gathered by the Engineers Association in the Gaza Strip from the municipalities, May 1991.

54/ Ibid.

55/ Ibid.

56/ See the section on electricity in M. Benvenisti, Z. Abu-Zayad, and D. Rubinstein, The West Bank handbook: a political lexicon, The Jerusalem Post, Jerusalem, 1986, pp. 75-77.

57/ Israel Central Bureau of Statistics, Statistical Abstract..., op. cit. pp. 752-753.

58/ M. Shuman, Electric Power..., op. cit., p. 5.

59/ Ibid.

60/ H. El-Umari, "The past and the future of the Jerusalem District Electricity Company", presented at the Workshop on energy in the West Bank and Gaza Strip, An-Najah National University, Nablus, 1991.

61/ Ibid.

62/ The Jerusalem District Electricity Company, 1985 Technical Report, Jerusalem, 1985 (in Arabic), and H. El-Umari, "The Past and the Future ...", op. cit.

63/ H. El-Umari, "The past and the future ...", op. cit.

64/ Data on the consumption of electricity were supplied by the engineers in the technical section of the Jerusalem District Electricity Company, May 1991.

65/ Ibid.

66/ H. El-Umari, "The past and the future ...", op. cit.

67/ Ibid.

68/ A. A'lawneh, and Q. Abu-Harb, The economic conditions in Arab Jerusalem, Arab Studies Society, Jerusalem, 1988 (in Arabic), pp. 111-125.

69/ Data were supplied by the engineers in the technical section of the Jerusalem District Electricity Company, May 1991.

70/ Ibid.

71/ Ibid.

72/ Ibid.

73/ M. Shuman, Electric power..., op. cit.

74/ H. El-Umari, "The past and the future ...", op. cit. For a detailed study of system load flows and other technical matters, see Kennedy and Donkin, Interim report on system load flow, fault level and future development studies, 1985. The Jerusalem District Electrical Company.

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77/ T. Nassar, "Nablus Electric ...", op. cit.

78/ Ibid.

79/ Ibid.

80/ Data gathered through personal communications with the engineers of the Department of Electricity at Nablus Municipality, April 1991.

81/ S. Zagha, "The future of the power station of Municipality of Nablus", presented in the Workshop on energy in the West Bank and Gaza Strip, An-Najah National University, Nablus, 1991.

82/ Ibid.

83/ Ibid.

84/ Data gathered through personal communications with the engineers of the Department of Electricity at Nablus Municipality, April 1991.

85/ M. Shuman, Electric power..., op. cit., p. 8.

86/ Data gathered through personal communications with the engineers at Jenin Municipality, April 1991.

87/ M. Shuman, Electric power..., op. cit., pp. 7-8.

88/ Data gathered through personal communications with the engineer of Tulkarm Municipality, April 1991.

89/ M. Shuman, Electric power..., op. cit., p. 6.

90/ Data gathered through personal communications with the engineers of Hebron Municipality, April 1991.

91/ Ibid.

92/ Israel Ministry of Defence, Judea, Samaria and the Gaza Strip 1967-1987, Jerusalem, 1987, p. 81.

93/ Israel Central Bureau of Statistics, Statistical abstract of Israel, op. cit. pp. 752-753.

94/ Data gathered through personal communications with the engineers of Gaza Municipality, April 1991.

95/ Ibid.

96/ Data gathered from the Municipality, by the Engineers Association in the Gaza Strip, May 1991.

97/ M. Haddad, The environment ..., op. cit. pp. 33-35.

98/ H. Aloul and M. Kurd, "Evaluation and development of Ramallah's wastewater treatment plant", Graduation Project, Birzeit University, 1989, pp. 58-63.

99/ The study of the proposed sewage treatment is presented in S. Syrkin Consulting, Nablus municipal sewerage scheme treatment and disposal, 1973.

100/ M. Haddad, The environment..., op. cit.

101/ Israel Central Bureau of Statistics, Judea, Samaria, and Gaza Area Statistics, Vol. 18, No. 1, Jerusalem, 1988, pp. 40-41.

102/ B. Abu-Bakr, and J. Abo-Omar, The economic feasibility of establishing a modern tannery in the West Bank, The Rural Research Centre, An-Najah National University, Nablus, 1988 (in Arabic).

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109/ According to the Municipal Engineer of Nablus, April 1991.

110/ This is based on a memorandum directed by the engineers in the Department of Water to the Head of the Department, May 1991.

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Research, Vol. 1, No. 4, pp. 57-66, An-Najah National University, Nablus, 1987.

112/ The 1982 data are calculated from the current water consumption multiplied by the percentage of consumption in 1982 as compared to that projected for 1990 (found to be 70 per cent for urban areas and 60 per cent for rural areas) as appear in M. Benvenisti and S. Khayat, The West Bank and Gaza Atlas, op. cit., p. 26.

113/ These average values for per capita consumption of water are calculated on the basis of the share of domestic household consumption in total consumption (84.8 per cent in the West Bank and 91.3 per cent in Gaza Strip), as found in H. Awartani, "A projection of the demand for water in the West Bank and Gaza Strip", (unpublished report), June 1991, p. 7.

114/ The per capita consumption of water for household use in Israel is calculated from data presented in Israel Central Bureau of Statistics, Statistical abstract of Israel, op. cit., p. 449.

115/ M. Benvenisti and S. Khayat, The West Bank and Gaza Atlas, op. cit., p. 26.

116/ M. Bilbaisi and M. Bani-Hani, "Water resources and their use in Jordan", in The proceedings of the conference on water resources in the Arab countries and their strategic significance, The University of Jordan, Amman, 1990 (in Arabic) pp. 64-66.

117/ H. Awartani, "A projection of the demand ...", op. cit., p. 7.

118/ Ibid.

119/ Calculated from data presented in Israel Central Bureau of Statistics, Statistical abstract of Israel, op. cit., p. 449.

120/ M. Bibaisi and M. Bani-Hani, "Water resources ...", op. cit., p. 65.

121/ Calculated from the data presented in the section on electricity in M. Benvenisti, 1986 Report: demographic, economic, legal, social and political developments in the West Bank, The Jerusalem Post, Jerusalem, 1986, pp. 22-24.

122/ Ibid.

123/ Calculated from data presented in Israel Central Bureau of Statistics, Statistical abstract of Israel, op. cit., pp. 445 and 447.

124/ Calculated from data presented in The Central Bank of Jordan, The 27th annual report, Amman, 1990 (in Arabic), p. 156.

125/ This percentage of household consumption in the occupied Palestinian territory is that of Jerusalem District as presented in Section B of Chapter II. The respective value in Israel is calculated from data presented in Israel Central Bureau of Statistics, Statistical abstract of Israel, op. cit., pp. 445 and 447.

126/ These data are presented earlier in Section B of Chapter II.

127/ M. Benvenisti, 1986 Report..., op. cit.

128/ B. Abu-Bakr, and J. Abo-Omar, The economic feasibility..., op. cit.

129/ All data presented here are extracted from Israel Central Bureau of Statistics, Judea, Samaria, and Gaza Area Statistics, Vol. 18, No. 2, Jerusalem, 1988, pp. 196-222.

130/ The percentages are calculated from data extracted from Israel Central Bureau of Statistics, Statistical abstract of Israel, op. cit., pp. 203 and 570-571.

131/ Israel Central Bureau of Statistics, Statistical abstract of Israel, op. cit. pp. 750-751.

132/ Israel Central Bureau of Statistics, Statistical abstract of Israel, op. cit. p. 752. For example, the drop in income from fuel taxes reached 77.7 per cent over the period 1987/88 to 1989/90.

133/ Figures are found in a memorandum entitled "United States aid disbursements to the West Bank and Gaza Strip" (undated).

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135/ Israel Central Bureau of Statistics, Judea, Samaria, and Gaza Area ..., op. cit., Vol. 18, No. 2, pp. 196-222.

136/ Israel Central Bureau of Statistics, Statistical abstract of Israel, op. cit. p. 203. The values are modified by the consumer price index presented in table 10.1 of the same reference, to compare all values on the basis of current prices.

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138/ Department of Water, 1988/1989 Annual Report, Nablus Municipality, 1989.

139/ Israel Central Bureau of Statistics, Statistical abstract of Israel, op. cit., p. 203.

140/ Jerusalem District Electricity Company, 1988 Financial Statement, Jerusalem, 1989.

141/ Israel Central Bureau of Statistics, "Statistical abstract ...", op. cit., pp. 570-571.

142/ M. Bilbaisi and M. Bani-Hani, "Water resources ...", op. cit. p. 59.

143/ Israel Central Bureau of Statistics, "Statistical abstract ...", op. cit., p. 715.

144/ Israel Central Bureau of Statistics, "Statistical abstract ...", op. cit., p. 205.

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147/ M. Benvenisti and S. Khayat, "The West Bank ...", op. cit., p. 26.

148/ Jerusalem District Electricity Company, 1988 Financial Statement, op. cit.

149/ As presented earlier in section B of chapter II.

TABLES

Table 1. Area and population of the West Bank and Gaza Strip, 1990

Sub-district	Area Km^2	Current population (thousands)		
		Total	Urban a/	Rural b/
West Bank (all districts)	5 504	1 090.0	552.8	537.2
Thereof:				
Jerusalem	284	206.2	148.0 c/	58.2
Ramallah	770	135.7	54.6	81.1
Bethlehem	565	90.1	46.0	44.1
Jericho	338	15.7	10.5	5.2
Nablus	1 587	230.5	102.4	128.1
Jenin	572	118.8	43.0	75.8
Tulkarm	332	103.9	45.7	58.2
Hebron	1 056	189.1	102.6	86.5
Gaza Strip	366	636.0	449.7	186.3

Source: Data on current total population (i.e., at the end of 1990) of the West Bank (excluding east Jerusalem) and Gaza Strip are estimated based on the figures in Israel, CBS, Statistical Abstract of Israel, No. 41, Jerusalem, 1990, and Municipality of Jerusalem, Statistical Yearbook of Jerusalem, Jerusalem, 1986. Data on area and on urban/rural population split are estimated based on figures in M. Benvenisti, The West Bank and Gaza Atlas, WBDBP, Jerusalem, 1988.

a/ Including the population of all cities and towns with municipal councils and of refugee camps within municipality limits.

b/ Including population of refugee camps outside municipal boundaries.

c/ Population of Jerusalem includes all the non-Jewish population and that of villages around Jerusalem within the Jerusalem municipality limits.

Table 2. Domestic water consumption in urban areas of the West Bank in 1990
(million cubic metres/yr)

	Total	Municipal well	Private well	Spring	West Bank Water Department	Mekorot	Jerusalem Municipality e/	Average (litre/ capita/day)
West Bank (all cities and towns) a/	17.926	7.506	0.621	1.874	1.373	3.776	2.776	..
Thereof:								
Total (cities)	16.073	7.224	0.145	1.874	1.028	3.026	2.776	..
Jerusalem	2.687	-	-	-	-	-	2.687	52.6
Ramallah	1.415	0.580 b/	-	-	-	0.746	0.089	59.4
Bethlehem	1.252	0.772 c/	-	-	-	0.480	-	57.7
Jericho	0.245	-	-	0.245	-	-	-	35.4
Nablus	4.596	2.851	-	1.629	-	0.116	-	55.1
Jenin	1.095	0.183	-	-	0.912	-	-	62.0
Tulkarm d/	2.253	2.108	0.145	-	-	-	-	102.5
Hebron	2.530	0.730	-	-	-	1.800	-	34.6

Source: Field survey data.

a/ Figures include consumption in 18 other small towns.

b/ Source: Ramallah Water Authority.

c/ Source: Bethlehem Water Authority.

d/ Including agricultural consumption within city limits.

e/ West Bank localities served by Jerusalem municipality.

Table 3. Domestic water consumption in rural areas of the West Bank in 1990 (via distribution systems)

(million cubic metres/year)

Sub-district	Total	Municipal well	Private well	Spring	West Bank Water Department	Mekorot
West Bank (all sub-districts)	7.432	2.622	0.601	0.246	2.458	1.505
Thereof:						
Jerusalem	1.686	1.458 a/	-	-	-	0.228
Ramallah	1.420	0.934 a/	-	-	0.139	0.347
Bethlehem	0.600	0.043 b/	-	-	0.445	0.112
Jericho	0.196	-	-	-	-	0.196
Nablus	1.157	0.187	0.020	0.210	0.179	0.561
Jenin	0.376	-	0.014	0.036	0.265	0.061
Tulkarm	0.698	-	0.567	-	0.131	-
Hebron	1.299	-	-	-	1.299	-

Source: Field survey data.

a/ Source: Ramallah Water Authority.

b/ Source: Bethlehem Water Authority.

Table 4. Water production for domestic use in Gaza Strip, 1990

Area	No. of wells	Total discharge (million cubic meters/yr)
Gaza	16	12.50
Deir El-Balah	3	0.20
Rafah	2	3.15
Beit Hanon	2	0.44
Beit Lahia	3	1.27
Jabalia	6	1.40
Khan Yunis	6	3.90
Bani Suhaila	2	0.10
Abasan	2	0.10
UNRWA	7	0.61
Total	52	23.67

Source: Field survey data, based on estimates of Engineers Association in the Gaza Strip.

Table 5. Solid waste collection in cities of the West Bank, 1990

City	Crew size	Landfill (dunums) a/	Collection vehicles	Minimum estimated waste (tons/day)
East Jerusalem	..	..	..	200
Ramallah	60	6	3	20
Bethlehem	45	..	4	25
Jericho	15	.. b/	2	15
Nablus	126	13	7	240
Jenin	..	.. b/	2	30
Tulkarm	31	4	3	50
Hebron	..	40	5	140

Source: M. Haddad, "The Environment in the Occupied Palestinian Territory", (preliminary report prepared for the Conference on the Management of the Environment of the Mediterranean, Nicosia), Centre for Engineering and Planning, Ramallah, 1990.

a/ one dunum = 1,000 m^2 = 0.25 acre

b/ No specific size of landfill exists and waste is thrown in the open.

Table 6. Capital investment by municipalities in the West Bank and Gaza Strip in public utilities for 1987/88

(New Israeli shekels)

Utility	West Bank		Gaza Strip	
	Total	Per capita	Total	Per capita
Water	..	..	1 237 199	2.19
Electricity	2 280 911	2.63	1 573 381	2.78
Wastewater and solid waste	2 053 124	2.37	1 854 066	3.28
Public building a/	3 636 944	4.19	1 984 600	3.51
Total (Israeli shekel)	7 970 979	9.19	4 664 646	11.76
Total (US dollar)	4 773 041	5.50	2 793 201	7.04

Source: Data are extracted from Israel Central Bureau of Statistics, Judea, Samaria and Gaza Area Statistics, Vol. XVIII, No. 2, Jerusalem, 1988, pp. 196-222.

a/ Including public markets, slaughterhouses and schools.